HILLSBOROUGH COUNTY SHERIFF'S OFFICE RENOVATIONS
PINEBROOKE BUSINESS PARK

2211 NORTH FALKENBURG ROAD
TAMPA, FLORIDA 33619

TO BE CONSTRUCTED FOR:
Hillsborough County Sheriff's Office
2008 East 8th Avenue
Tampa, Florida 33605

100% CONSTRUCTION DOCUMENTS

DATE ISSUED: NOVEMBER 16, 2015

ARCHITECT
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SPECIFICATIONS

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SECTION 01230 - ALTERNATES

PART 1 - GENERAL

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

1.2 SUMMARY
- A. This Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS
- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to the Base Bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
  1. The cost for each alternate is the net addition to the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES
- A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
  1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
  2. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.
  3. Execute accepted alternates under the same conditions as other work of the Contract.
  4. Schedule: A Schedule of Alternates is included below.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES
- A. Alternate No. 1: Exterior Painting
  1. Base Bid: Do not provide cleaning, preparing and painting of the building exterior.
  2. Alternate: Pressure wash, prepare and paint, entire building exterior, including metal panel roofs at entries.
- B. Alternate No. 2: Tilt-panel Joints.
  1. Base Bid: Do not replace exterior joint material at tilt-panels.
  2. Alternate: Remove existing material, clean joint and apply new sealant at all existing exterior tilt-panel joints.
- C. Alternate No. 3: Remaining Building Joints.
  1. Base Bid: Do not replace exterior building joints at storefront systems, hollow metal frames, and building joints not associated with tilt-panels.
  2. Alternate: Replace all remaining exterior building joints, including perimeter of storefront systems, hollow metal frames, and all other building joints not included in Alternate 2.
- D. Alternate No. 4: Storefront Glazing Gaskets.
  1. Base Bid: Do not replace storefront glazing gaskets.
  2. Alternate: Remove and replace existing glazing gaskets at all storefront assemblies.

END OF SECTION

SECTION 01100 - SUMMARY

PART 1 - GENERAL

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

1.2 WORK COVERED BY CONTRACT DOCUMENTS
A. Project Identification: Hillsborough County Sheriff's Office Renovations, Pinebrook Business Park.
1. Project Location: 2211 North Falkenburg Road, Tampa, Florida 33619.

1.3 PROJECT TEAM
A. Owner: Hillsborough County Sheriff's Office.
1. Owner Representative: Al Cordova, R.A., Special Projects Manager.
B. Architect: Wilder Architecture, Inc.

1517 Seventh Avenue, Suite C
Tampa, Florida
33605

Phone: 813-242-6677
Fax: 813-242-6683

1. Architect Identification: The 100% Construction Document submittal, dated 11/16/2015, were prepared for the Project by Wilder Architecture, Inc.

1.4 SCOPE OF WORK
A. The Work includes, but is not limited to, the following:
1. Demolition:
a. Exisiting GWB partition demolition.
b. Hollow metal doors and frames.
c. Interior Finishes.
d. Electrical.
e. Mechanical.
2. New GWB partitions.
3. Installation of new doors and frames.
4. New finish installation.
5. New acoustical ceiling installation.
6. New electrical oulets.
7. New communications conduit and boxes.
8. New lighting fixtures.
9. Ductwork modifications with the relocation of partitions.
10. New fire suppression system.

1.5 CONTRACTS
A. Project will be constructed under a single general construction contract. Terms as dictated by the Hillsborough County Sherif's Offce front-end documents (Division 0).

1.6 USE OF PREMISES
A. General: Contractor shall have use of premises for construction operations, including limited use of Project site, during construction period. Contractor's use of premises is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

1.7 SPECIFICATION FORMATS AND CONVENTIONS
A. Format: The Specifications are organized into Divisions and Sections using the 16-division format and CSI/CSC's "MasterFormat" numbering system.
1. Section Identification: The Specifications use section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of sections in the Contract Documents.
B. Conventions: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated,

shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.

2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
   a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

END OF SECTION

SECTION 01250 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

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

1.2 SUMMARY
- A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Sections include the following:
  1. Division 1 Section "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

1.3 MINOR CHANGES IN THE WORK
- A. Architect will issue through Construction Manager supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on the Architect's Supplemental Instructions form.

1.4 CONTRACTOR'S REQUEST FOR INFORMATION (RFI'S)
- A. The Contractor may, after exercising due diligence to locate required information, request from the Architect clarification or interpretation of the requirements of the Contract Documents. The submittal shall be provided electronically and include the date by which the information is needed. RFI's are to be issued not less than 10 days prior to the date needed. The Architect shall, with reasonable promptness, respond to such Contractor's request for clarification or interpretation. However, if the information requested by the Contractor is apparent from field observations, is contained in the Contract Documents or is reasonably inferred from them, the Contractor shall be responsible to the Owner for all reasonable cost charged by the Architect to the Owner for the Additional Services required to provide such information.
- B. The Architect's response to the Contractor's request for clarification or interpretation shall NOT constitute direction to make changes to the work that will increase the Contract Sum or Contract Time.
  1. The Architect's response shall be on the Architect's Supplemental Instructions form or directly on the Contractor's Request for Information form, in which case it is the Architect's opinion that any Change in the Work is minor and does not involve adjustment to the Contract Sum or the Contract Time.
  2. If the Architect determines that the response requires a change involving an adjustment to the Contract Sum or the Contract Time, the response will be issued in the form of a Proposal Request.

1.5 PROPOSAL REQUESTS
- A. Owner-Initiated Proposal Requests: Architect through Construction Manager will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and/or Specifications.
  1. Proposal Requests issued by Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
  2. Within time specified in Proposal Request after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
     a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
     b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
     c. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
- B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change.
  1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
  2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
  3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

4. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
5. Comply with requirements in Division 1 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.

1.6 CHANGE ORDER PROCEDURES

A. Change Orders will be executed via AIA Document G701-2001, Change Order.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01290 - PAYMENT PROCEDURES

PART 1 - GENERAL

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

1.2 SUMMARY
- A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Sections include the following:
  1. Division 1 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
  2. Division 1 Section "Construction Progress Documentation" for administrative requirements governing preparation and submittal of Contractor's Construction Schedule and Submittals Schedule.

1.3 DEFINITIONS
- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES
- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
  1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
     a. Application for Payment forms with Continuation Sheets.
     b. Submittals Schedule.
  2. Submit the Schedule of Values to Architect at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
  3. Subschedules: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values correlated with each phase of payment.
- B. Format and Content:
  1. Identification: Include the following Project identification on the Schedule of Values:
     a. Project name and location.
     b. Name of Architect.
     c. Architect's 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 the 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.
        1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
  3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate.
  4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
  5. 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 evidence of insurance or bonded warehousing if required.
  6. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
  7. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT
A. Invoicing and Payment will be submitted and processed per HCSO procedures.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01310 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

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

1.2 SUMMARY
- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
  1. General project coordination procedures.
  2. Coordination Drawings.
  3. Administrative and supervisory personnel.
  4. Project meetings.
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.
- C. Related Sections: The following Sections contain requirements that relate to this Section:
  1. Division 1 Section "Execution Requirements" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
  2. Division 1 Section "Closeout Procedures" for coordinating Contract closeout.

1.3 COORDINATION
- A. Coordination: Coordinate construction operations included in various Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
  1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
  2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
  3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
  1. Preparation of Contractor's Construction Schedule.
  2. Preparation of the Schedule of Values.
  3. Installation and removal of temporary facilities and controls.
  4. Delivery and processing of submittals.
  5. Progress meetings.
  6. Preinstallation conferences.
  7. Project closeout activities.

1.4 SUBMITTALS
- A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
  1. Indicate relationship of components shown on separate Shop Drawings.
  2. Indicate required installation sequences.
  3. Refer to Division 15 Section "Mechanical Requirements" and Division 16 Section "Basic Methodsand Requirements" for specific Coordination Drawing requirements for mechanical and electrical installations.
- B. Staff Names: Within 15 days of starting construction operations, submit a list of principal staff assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list telephone numbers including email addresses and cell phone numbers.

1.5 PROJECT MEETINGS
- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.
  1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
  2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
  3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within 3 days of the meeting.

B. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
   1. Attendees: Construction Manager, installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect and Owner, of scheduled meeting dates.
   2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
      a. Contract Documents.
      b. Options.
      c. Related Change Orders.
      d. Deliveries.
      e. Submittals.
      f. Review of mockups.
      g. Possible conflicts.
      h. Compatibility problems.
      i. Time schedules.
      j. Weather limitations.
      k. Manufacturer's written recommendations.
      l. Warranty requirements.
      m. Compatibility of materials.
      n. Acceptability of substrates.
      o. Temporary facilities and controls.
      p. Space and access limitations.
      q. Regulations of authorities having jurisdiction.
      r. Testing and inspecting requirements.
      s. Required performance results.
      t. Protection of construction and personnel.
   3. Record significant conference discussions, agreements, and disagreements.
   4. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01320 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
   1. Preliminary Construction Schedule.
   2. Contractor's Construction Schedule.
   3. Submittals Schedule.
   4. Preliminary Network Diagrams.
   5. CPM reports.
   6. Field condition reports.
   7. Special reports.

B. Related Sections include the following:
   1. Division 1 Section "Payment Procedures" for submitting the Schedule of Values.
   2. Division 1 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes.
   3. Division 1 Section "Submittal Procedures" for submitting schedules and reports.
   4. Division 1 Section "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
   1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
   2. Predecessor activity is an activity that must be completed before a given activity can be started.

B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

C. Critical Path: The longest continuous chain of activities through the network schedule that establishes the minimum overall Project duration and contains no float.

D. Event: The starting or ending point of an activity.

E. Float: The measure of leeway in starting and completing an activity.
   1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
   2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the following activity.
   3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

F. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.

G. Major Area: A story of construction, a separate building, or a similar significant construction element.

H. Milestone: A key or critical point in time for reference or measurement.

I. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.

1.4 SUBMITTALS

A. Submittals Schedule: Submit three copies of schedule. Arrange the following information in a tabular format:
   1. Scheduled date for first submittal.
   2. Specification Section number and title.
   3. Submittal category (action or informational).
   4. Name of subcontractor.
   5. Description of the Work covered.
   6. Scheduled date for Architect's final release or approval.

B. Preliminary Construction Schedule: Submit two printed copies.

C. Preliminary Network Diagram: Submit two printed copies; large enough to show entire network for entire construction period.
D. Contractor's Construction Schedule: Submit two printed copies of initial schedule, large enough to show entire schedule for entire construction period.
E. CPM Reports: Concurrent with CPM schedule, submit two printed copies of each of the following computer-generated reports. Format for each activity in reports shall contain activity number, activity description, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float.
   1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
   2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
   3. Total Float Report: List of all activities sorted in ascending order of total float.
F. Field Condition Reports: Submit two copies at time of discovery of differing conditions.
G. Special Reports: Submit two copies at time of unusual event.

1.5 COORDINATION
A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.
   1. Secure time commitments for performing critical elements of the Work from parties involved.
   2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE
A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.
   1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
   2. Initial Submittal: Submit concurrently with preliminary network diagram. Include submittals required during the first 60 days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
      a. At Contractor's option, show submittals on the Preliminary Construction Schedule, instead of tabulating them separately.
   3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL
A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."
B. Time Frame: Extend schedule from construction commencement date to date of Final Completion.
   1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
C. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
   1. Activity Duration: Define activities so no activity is longer than 21 days, unless specifically allowed by Architect.
   2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
   3. Submittal Review Time: Include review and resubmittal times indicated in Division 1 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
   4. Startup and Testing Time: Include not less than 14 days for startup and testing.
   5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
   1. Phasing: Arrange list of activities on schedule by phase.

2. Work Restrictions: Show the effect of the following items on the schedule:
   a. Coordination with existing construction.
   b. Seasonal variations.
   c. Environmental control.
3. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
   a. Subcontract awards.
   b. Submittals.
   c. Fabrication.
   d. Installation.
   e. Tests and inspections.
   f. Startup and placement into final use and operation.

E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.

F. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

A. General: Prepare network diagrams using AON (activity-on-node) format.

B. Preliminary Network Diagram: Submit diagram within 14 days of date established for the Notice to Proceed. Outline significant construction activities for the first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

C. CPM Schedule: Prepare Contractor's Construction Schedule using a CPM network analysis diagram.
1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 30 days after date established for the Notice to Proceed.
2. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
3. Use "one workday" as the unit of time.

D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the preliminary network diagram, prepare a skeleton network to identify probable critical paths.
1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
   a. Preparation and processing of submittals.
   b. Purchase of materials.
   c. Delivery.
   d. Fabrication.
   e. Installation.
2. Processing: Process data to produce output data or a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
3. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
   a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.

E. Initial Issue of Schedule: Prepare initial network diagram from a list of straight "early start-total float" sort. Identify critical activities. Prepare tabulated reports showing the following:
1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Principal events of activity.
4. Immediate preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.
8. Total float or slack time.

F. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.
5. Changes in the critical path.
6. Changes in total float or slack time.

7. Changes in the Contract Time.

2.4 REPORTS

A. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare a detailed report. Submit with a request for information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.5 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.
B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
   1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
   2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
   3. As the Work progresses, indicate Actual Completion percentage for each activity.
B. Distribution: Distribute copies of approved schedule to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
   1. Post copies in Project meeting rooms and temporary field offices.
   2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION

SECTION 01330 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

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

1.2 SUMMARY
- A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, Approved Products List, and other miscellaneous submittals.
- B. Related Sections include the following:
  1. Division 1 Section "Project Management and Coordination" for submitting Coordination Drawings.
  2. Division 1 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's Construction Schedule and the Submittals Schedule.
  3. Division 1 Section "Quality Requirements" for submitting test and inspection reports and Delegated-Design Submittals.
  4. Division 1 Section "Closeout Procedures" for submitting warranties, Project Record Documents and operation and maintenance manuals.

1.3 DEFINITIONS
- A. Action Submittals: Written and graphic information that requires Architect's responsive action.
- B. Informational Submittals: Written information that does not require Architect's approval. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL PROCEDURES
- A. General: Submit submittals in Adobe Portable Document Format (PDF) minimum version 4.0 with Submittal Transmittal in Word for Windows version 2000 (Word) to Architect for review.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
  1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
  2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
     a. Architect and Construction Manager reserve the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
     b. Submit color selection data as a single package. Color selections will be made at the same time. Architect will return color selections on a schedule a copy of which is included at the end of this section.
  3. Dissimilar Metals: The Construction Manager shall coordinate and verify that independent building systems are installed in such a manner to avoid the direct contact of dissimilar metals to prevent the occurence of galvanic corrosion.
- C. Submittals Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.
- D. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal.
  1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. Architect will advise Construction Manager when a submittal being processed must be delayed for coordination.
  2. Concurrent Review: Where concurrent review of submittals by Architect's consultants, Owner, or other parties is required, allow 21 days for initial review of each submittal.
     a. Miscellaneous Metals
     b. Division 15
     c. Division 16
  3. If intermediate submittal is necessary, process it in same manner as initial submittal.
  4. Allow 15 days for processing each resubmittal.
  5. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing.
- E. Identification: Place a permanent label or title block on each submittal for identification. Provide in PDF for electronic submittals.
  1. Indicate name of firm or entity that prepared each submittal on label or title block.

2. Provide a space beside title block to record Contractor's review and approval markings and action taken by Architect and Construction Manager.
3. Include the following information on label for processing and recording action taken:
   a. Project name.
   b. Date.
   c. Name and address of Architect.
   d. Name and address of Construction Manager.
   e. Name and address of subcontractor.
   f. Name and address of supplier.
   g. Name of manufacturer.
   h. Number and title of appropriate Specification Section.
   i. Drawing number and detail references, as appropriate.
   j. Other necessary identification.
4. Electronic PDF submittal files shall be named utilizing the specification number followed by a sequential number for the submittal made under the given specification number followed by "r#" if it is a resubmittal, and then followed by a brief description of the submitted item.
   a. The description shall indicate the actual item submitted, shall not be general in nature, and does not have to be that of the specification section heading.
   b. Using the example, "15135-4r2 Differential Pressure Gauge"; 15135 – Meters and Gauges is the relevant specification, the "4" shows it was the fourth submittal for specification section 15135, "r2" shows it was the second resubmittal, and the description indicates what item is submitted.
   c. Each specification item shall be submitted in a separate PDF file. PDF files with multiple specification items will be returned without review.
   d. Each file shall have sufficient space allowance for the Architects review stamp(s).
   e. Each file shall have the Constructions Managers review stamp(s) and indicate information required by specification 01330-1.4.E.3 above.
5. All marks made by the Construction Manager shall be in green.

F. Deviations: Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals.
G. Additional Copies: Unless additional copies are required for final submittal, and unless Architect or Construction Manager observes noncompliance with provisions of the Contract Documents, initial submittal may serve as final submittal.
H. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will discard submittals received from sources other than Construction Manager.
   1. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements of the Contract Documents, including minor variations and limitations. Include the same label information as the related submittal.
   2. Include Contractor's certification stating that information submitted complies with requirements of the Contract Documents.
   3. Transmittal Form: Use sample form at End of Section.
I. Submittal Checklist: Provide submittal items as indicated per specification section in the submittal checklist included in Appendix 1.

WILDERARCHITECTURE, INC.

1517 East Seventh Avenue, Suite C
Tampa, Florida 33605
813.242.6677
lw@wilderarchitecture.com

SUBMITTAL TRANSMITTAL

Project:	HILLSBOROUGH COUNTY SHERIFF'S OFFICE RENOVATIONS – PINEBOORK BUSINESS PARK	Contractors No.: XXXXX-XX WAI No.: 1505/CA-15 Consultants No.:
Submittal No:	1	
Specification Section:	Section 09912 - Painting	

Contractor:	Architect:	Consultant:
	WilderArchitecture, Inc. 1517 East Seventh Ave Suite C Tampa, Florida 33605	Anston-Greenlees, Inc. 1315 West Fletcher Ave. Suite A Tampa, FL 33612

Transmittal Record:

	Date Sent	Date Received
XX- to WAI		
WAI to -		
- to WAI		
WAI to - XX		

Item No.	Copies	Description	Action

Action Codes:

A	No Exceptions Taken	FYA	For Your Approval
B	Exceptions Taken As Noted	FYI	For Your Information
C	Rejected	FYU	For Your Use
D	Revise and Resubmit	FYC	For your Review and Comment

Contractor's Comments:

Architect's Comments:

Engineer's Comments:

END OF SECTION

SECTION 01340 - INSPECTIONS

PART 1 - GENERAL

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

1.2 SUMMARY
- A. This Section includes administrative and procedural requirements for coordinating with Owner's personnel, including the following:
- B. Required Code Inspections.
- C. Quality Control Inspections.
- D. Substantial Completion Inspection.
- E. Final Completion Inspection.

1.3 INSPECTIONS
- A. Florida Building Code Required Inspections:
  1. Instructions can be found on the Florida Building Code website, www.floridabuilding.org, regarding inspections that are specifically required by the Florida Building Code, Chapter 1.
- B. Quality Control Inspections:
  1. Requests for inspections which are not specifically required by the Florida Building Code are to be forwarded directly via e-mail to the Architect of Record.
- C. Substantial Completion and Final Completion Inspections:
  1. These inspections will be scheduled by Architect upon confirming that the project is ready for inspection. The Project Coordinator is to be alerted seven days in advance of the inspection in order to give adequate notice. The Architect, Consulting Engineers, and General Contractor must all be present on the date/time selected for the inspection.

PART TWO - PRODUCTS (NOT USED)

PART THREE - EXECUTION (NOT USED)

END OF SECTION

SECTION 01400 - QUALITY REQUIREMENTS

PART 1 - GENERAL

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

1.2 SUMMARY
- A. This Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
  1. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
  2. Specified tests, inspections, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with the Contract Document requirements.
  3. Requirements for Contractor to provide quality-control services required by Architect, Owner, Construction Manager, or authorities having jurisdiction are not limited by provisions of this Section.
- C. Related Sections include the following:
  1. Division 1 Section "Cutting and Patching" for repair and restoration of construction disturbed by testing and inspecting activities.
  2. Divisions 2 through 16 Sections for specific test and inspection requirements.

1.3 DEFINITIONS
- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and ensure that proposed construction complies with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that completed construction complies with requirements. Services do not include contract enforcement activities performed by Architect or Construction Manager.
- C. Mockups: Full-size, physical example assemblies to illustrate finishes and materials. Mockups are used to verify selections made under Sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Mockups establish the standard by which the Work will be judged.
- D. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

1.4 DELEGATED DESIGN
- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
  1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

1.5 SUBMITTALS
- A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.
- C. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
  1. Specification Section number and title.
  2. Description of test and inspection.
  3. Identification of applicable standards.
  4. Identification of test and inspection methods.
  5. Number of tests and inspections required.
  6. Time schedule or time span for tests and inspections.

7. Entity responsible for performing tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

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

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

1.6 QUALITY ASSURANCE

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

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

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

D. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the State of Florida and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
1. Requirement for specialists shall not supersede building codes and similar regulations governing the Work, nor interfere with local trade-union jurisdictional settlements and similar conventions.

G. Testing Agency Qualifications: An agency with the experience and capability to conduct testing and inspecting indicated, as documented by ASTM E 548, and that specializes in types of tests and inspections to be performed.

1.7 QUALITY CONTROL

A. Contractor Responsibilities: Unless otherwise indicated, provide quality-control services specified and required by authorities having jurisdiction.
1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

B. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing.
C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that revised or replaced Work that failed to comply with requirements established by the Contract Documents.
D. Testing Agency Responsibilities: Cooperate with Architect, Construction Manager, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
    1. Notify Architect, Construction Manager, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
    2. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
    3. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
    4. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.
    5. Do not perform any duties of Contractor.
E. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
    1. Access to the Work.
    2. Incidental labor and facilities necessary to facilitate tests and inspections.
F. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
    1. Schedule times for tests, inspections, obtaining samples, and similar activities.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION
A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
    1. Provide materials and comply with installation requirements specified in other Sections of these Specifications. Restore patched areas and extend restoration into adjoining areas in a manner that eliminates evidence of patching.
    2. Comply with the Contract Document requirements for Division 1 Section "Cutting and Patching."
B. Protect construction exposed by or for quality-control service activities.
C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION

SECTION 01420 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.
B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "approved," "required," and "permitted" have the same meaning as "directed."
D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
H. "Provide": Furnish and install, complete and ready for the intended use.
I. "Installer": Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
    1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.
J. "Owner": Hillsborough County Sheriff's Office.
K. "Experienced": When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
L. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
B. Publication Dates: Comply with standards in effect per the FBC as of date of the Contract Documents, unless otherwise indicated. Refer to the 2014 Florida Buidling Code: Building - Referenced Standards for the proper date/edition of the referenced standard. The standards are listed in Chapter 35 by the promulgating agency of the standard, the standard identification, the effective date and title, and the section or sections of this document that reference the standard. If the referenced standard is not governed by the Code, the most recent version of the standard shall apply.
C. Conflicting Requirements: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.
    1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.
D. Copies of Standards: Each entity engaged in construction on Project must be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source and make them available on request.

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

AA	Aluminum Association, Inc. (The)	(202) 862-5100	www.aluminum.org
AAADM	American Association of Automatic Door Manufacturers	(216) 241-7333	www.aaadm.com
AABC	Associated Air Balance Council	(202) 737-0202	www.aabchq.com
AAMA	American Architectural Manufacturers Association	(847) 303-5664	www.aamanet.org
ACI	American Concrete Institute/ACI International	(248) 848-3700	www.aci-int.org
ACPA	American Concrete Pipe Association	(972) 506-7216	www.concrete-pipe.org
ADC	Air Diffusion Council	(312) 201-0101	www.flexibleduct.org
AGC	Associated General Contractors of America (The)	(703) 548-3118	www.agc.org
AI	Asphalt Institute	(859) 288-4960	www.asphaltinstitute.org
AIA	American Institute of Architects (The)	(202) 626-7300	www.e-architect.com
AISC	American Institute of Steel Construction	(800) 644-2400	www.aisc.org
AISI	American Iron and Steel Institute	(202) 452-7100	www.steel.org
ANSI	American National Standards Institute	(202) 293-8020	www.ansi.org
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers	(800) 527-4723	www.ashrae.org

ASTM	American Society for Testing and Materials	(610) 832-9585	www.astm.org
AWI	Architectural Woodwork Institute	(800) 449-8811	www.awinet.org
AWPA	American Wood-Preservers' Association	(817) 326-6300	www.awpa.com
AWS	American Welding Society	(800) 443-9353	www.aws.org
AWWA	American Water Works Association	(800) 926-7337	www.awwa.org
BHMA	Builders Hardware Manufacturers Association	(212) 297-2122	www.buildershardware.com
BIA	Brick Industry Association (The)	(703) 620-0010	www.bia.org
CISPI	Cast Iron Soil Pipe Institute	(423) 892-0137	www.cispi.org
CLFMI	Chain Link Fence Manufacturers Institute	(301) 596-2583	www.chainlinkinfo.org
CRSI	Concrete Reinforcing Steel Institute	(847) 517-1200	www.crsi.org
CSI	Construction Specifications Institute (The)	(800) 689-2900	www.csinet.org
DHI	Door and Hardware Institute	(703) 222-2010	www.dhi.org
FGMA	Flat Glass Marketing Association	(See GANA)	
GA	Gypsum Association	(202) 289-5440	www.gypsum.org
GANA	Glass Association of North America	(785) 271-0208	www.glasswebsite.com/gana
ML/SFA	Metal Lath/Steel Framing Association	(See SSMA)	
NAAMM	National Association of Architectural Metal Manufacturers	(312) 332-0405	www.naamm.org

NEBB	National Environmental Balancing Bureau	(301) 977-3698	www.nebb.org
NECA	National Electrical Contractors Association	(301) 657-3110	www.necanet.org
NEMA	National Electrical Manufacturers Association	(703) 841-3200	www.nema.org
NFPA	National Fire Protection Association	(800) 344-3555	www.nfpa.org
NHLA	National Hardwood Lumber Association	(800) 933-0318	www.natlhardwood.org
NRCA	National Roofing Contractors Association	(800) 323-9545	www.nrca.net
RFCI	Resilient Floor Covering Institute	(Contact by mail only)	
SDI	Steel Deck Institute	(847) 462-1930	www.sdi.org
SDI	Steel Door Institute	(440) 899-0010	www.steeldoor.org
SGCC	Safety Glazing Certification Council	(315) 646-2234	www.sgcc.org
SJI	Steel Joist Institute	(843) 626-1995	www.steeljoist.org
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association	(703) 803-2980	www.smacna.org
TCA	Tile Council of America, Inc.	(864) 646-8453	www.tileusa.com
WCMA	Window Covering Manufacturers Association (Formerly: AWCMA - American Window Covering Manufacturers Association)	(800) 506-4653	www.windowcoverings.org

WDMA	Window & Door Manufacturers Association (Formerly: NWWDA - National Wood Window and Door Association)	(800) 223-2301	www.wdma.com

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.
   1. FBC: Florida Building Code
      a. http://www.floridabuilding.org/c/default.aspx
      b. (850) 487-1824

END OF SECTION

SECTION 01500 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

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

1.2 SUMMARY
- A. This Section includes requirements for temporary facilities and controls, including temporary utilities, support facilities, and security and protection facilities.
- B. Temporary utilities include, but are not limited to, the following:
  1. Water service and distribution.
  2. Sanitary facilities, including toilets, wash facilities, and drinking-water facilities.
  3. Heating and cooling facilities.
  4. Ventilation.
  5. Electric power service.
  6. Lighting.
  7. Telephone service.
- C. Support facilities include, but are not limited to, the following:
  1. Project identification and temporary signs.
  2. Waste disposal facilities.
  3. Field office.
  4. Storage and fabrication sheds.
  5. Construction aids and miscellaneous services and facilities.
- D. Related Sections include the following:
  1. Division 1 Section "Submittal Procedures" for procedures for submitting copies of implementation and termination schedule and utility reports.
  2. Division 1 Section "Execution Requirements" for progress cleaning requirements.
  3. Divisions 2 through 16 for temporary heat, ventilation, and humidity requirements for products in those Sections.

1.3 USE CHARGES
- A. General: Cost or use charges for temporary facilities are not chargeable to Owner or Architect and shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, the following:
  1. Owner's construction forces.
  2. Architect.
  3. Testing agencies.
  4. Personnel of authorities having jurisdiction.

1.4 QUALITY ASSURANCE
- A. Standards: Comply with ANSI A10.6, NECA's "Temporary Electrical Facilities," and NFPA 241.
  1. Trade Jurisdictions: Assigned responsibilities for installation and operation of temporary utilities are not intended to interfere with trade regulations and union jurisdictions.
  2. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.5 PROJECT CONDITIONS
- A. Temporary Utilities: At earliest feasible time, when acceptable to Owner, change over from use of temporary service to use of permanent service.
  1. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.
- B. Conditions of Use: The following conditions apply to use of temporary services and facilities by all parties engaged in the Work:
  1. Keep temporary services and facilities clean and neat.
  2. Relocate temporary services and facilities as required by progress of the Work.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide new materials. Undamaged, previously used materials in serviceable condition may be used if approved by Architect. Provide materials suitable for use intended.

B. Chain-Link Fencing: Minimum 2-inch, 0.148-inch thick, galvanized steel, chain-link fabric fencing; minimum 6 feet high with galvanized steel pipe posts; minimum 2-3/8-inch OD line posts and 2-7/8-inch OD corner and pull posts.

C. Water: Potable.

2.2 EQUIPMENT

A. General: Provide equipment suitable for use intended.

1. Field Offices: Prefabricated or Mobile units with lockable entrances, operable windows, and serviceable finishes; heated and air conditioned; on foundations adequate for normal loading.

B. Fire Extinguishers: Hand carried, portable, UL rated. Provide class and extinguishing agent as indicated or a combination of extinguishers of NFPA-recommended classes for exposures.

1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

C. Self-Contained Toilet Units: Single-occupant units of chemical, aerated recirculation, or combustion type; vented; fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.

D. Drinking-Water Fixtures: Drinking-water fountains, or containerized, tap-dispenser, bottled-water drinking-water units, including paper cup supply.

E. Electrical Outlets: Properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-V plugs into higher-voltage outlets; equipped with ground-fault circuit interrupters, reset button, and pilot light.

F. Power Distribution System Circuits: Where permitted and overhead and exposed for surveillance, wiring circuits, not exceeding 125-V ac, 20-A rating, and lighting circuits may be nonmetallic sheathed cable.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve 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 when 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 appropriate local utility company to install temporary service or connect to existing service. Where utility company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with utility company recommendations.

B. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking-water fixtures. Comply with regulations and health codes for type, number, location, operation, and maintenance of fixtures and facilities.

1. Disposable Supplies: Provide toilet tissue, paper towels, paper cups, and similar disposable materials for each facility. Maintain adequate supply. Provide covered waste containers for disposal of used material.
2. Toilets: Use of facility in Job Trailer.
3. Toilets: Install self-contained toilet units. Shield toilets to ensure privacy.
4. Drinking-Water Facilities: Provide bottled-water, drinking-water units.
   a. Where power is accessible, provide electric water coolers to maintain dispensed water temperature at 45 to 55 deg F.

C. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment from that specified that will not have a harmful effect on completed installations or elements being installed.

1. Maintain a minimum temperature of 50 deg F in permanently enclosed portions of building for normal construction activities, and 65 deg F for finishing activities and areas where finished Work has been installed.

D. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment from that specified that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

E. Electric Power Service: Provide weatherproof, grounded electric power service and distribution system of sufficient size, capacity, and power characteristics during construction period. Include meters, transformers, overload-protected disconnecting means, automatic ground-fault interrupters, and main distribution switchgear.
F. Electric Distribution: Provide receptacle outlets adequate for connection of power tools and equipment.
   1. Provide waterproof connectors to connect separate lengths of electrical power cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.
G. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations and traffic conditions.
   1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
H. Telephone Service: Provide temporary telephone service throughout construction period for common-use facilities used by all personnel engaged in construction activities. Install separate telephone line for each field office and first-aid station.
   1. Provide additional telephone lines for the following:
      a. Provide a dedicated telephone line for each facsimile machine and computer with modem in each field office.

3.3 SUPPORT FACILITIES INSTALLATION
A. General: Comply with the following:
   1. Locate field offices, storage sheds, sanitary facilities, and other temporary construction and support facilities for easy access.
   2. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
B. Project Identification and Temporary Signs: Prepare Project identification and other signs in sizes indicated. Install signs where indicated to inform public and persons seeking entrance to Project. Do not permit installation of unauthorized signs.
   1. Engage an experienced sign painter to apply graphics for Project identification signs. Comply with details indicated.
   2. Construct signs of exterior-type Grade B-B high-density concrete form overlay plywood in sizes and thicknesses indicated. Support on posts or framing of preservative-treated wood or steel.
   3. Paint sign panel and applied graphics with exterior-grade alkyd gloss enamel over exterior primer.
   4. Architect to provide a template for the sign.
C. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Containerize and clearly label hazardous, dangerous, or unsanitary waste materials separately from other waste. Comply with Division 1 Section "Execution Requirements" for progress cleaning requirements.
   1. If required by authorities having jurisdiction, provide separate containers, clearly labeled, for each type of waste material to be deposited.
D. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment involved, including temporary utility services. Sheds may be open shelters or fully enclosed spaces within building or elsewhere on-site.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION
A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects. Avoid using tools and equipment that produce harmful noise. Restrict use of noisemaking tools and equipment to hours that will minimize complaints from persons or firms near Project site.
B. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.
   1. Provide fire extinguishers, installed on walls on mounting brackets, visible and accessible from space being served, with sign mounted above.
      a. Field Offices: Class A stored-pressure water-type extinguishers.
      b. Other Locations: Class ABC dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for exposures.
      c. Locate fire extinguishers where convenient and effective for their intended purpose; provide not less than one extinguisher on each floor at or near each usable stairwell.
   2. Store combustible materials in containers in fire-safe locations.

3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for firefighting. Prohibit smoking in hazardous fire-exposure areas.
4. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition.
5. Permanent Fire Protection: At earliest feasible date in each area of Project, complete installation of permanent fire-protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.
6. Develop and supervise an overall fire-prevention and first-aid fire-protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
7. Provide hoses for fire protection of sufficient length to reach construction areas. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.5 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage caused by freezing temperatures and similar elements.
   1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
C. Temporary Facility Changeover: Except for using permanent fire protection as soon as available, do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
   1. Materials and facilities that constitute temporary facilities are the property of Contractor. Owner reserves right to take possession of Project identification signs.
   2. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns.
   3. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
   4. At Substantial Completion, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements in Division 1 Section "Closeout Procedures."

END OF SECTION

SECTION 01600 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

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

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

1.3 DEFINITIONS
- A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
  1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation, shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
  2. New Products: Items that have not previously been incorporated into another project or facility, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.
  3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
- C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.
- D. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
- E. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

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

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING
- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.
  1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
  2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
  3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
  4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
  5. Store products to allow for inspection and measurement of quantity or counting of units.
  6. Store materials in a manner that will not endanger Project structure.

7. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
8. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
9. Protect stored products from damage.

B. Storage: Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

1.6 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
   1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
   2. Specified Form: Forms are included with the Specifications. Prepare a written document using appropriate form properly executed.
   3. Refer to Divisions 2 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.
C. Submittal Time: Comply with requirements in Division 1 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT OPTIONS

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged, and unless otherwise indicated, that are new at time of installation.
   1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
   2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
   3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
   4. Where products are accompanied by the term "as selected," Architect will make selection.
   5. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
B. Product Selection Procedures: Procedures for product selection include the following:
   1. Product: Where Specification paragraphs or subparagraphs titled "Product" name a single product and manufacturer, provide the product named.
      a. Substitutions may be considered, unless otherwise indicated.
   2. Manufacturer/Source: Where Specification paragraphs or subparagraphs titled "Manufacturer" or "Source" name single manufacturers or sources, provide a product by the manufacturer or from the source named that complies with requirements.
      a. Substitutions may be considered, unless otherwise indicated.
   3. Products: Where Specification paragraphs or subparagraphs titled "Products" introduce a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
   4. Manufacturers: Where Specification paragraphs or subparagraphs titled "Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.
   5. Basis-of-Design Products: Where Specification paragraphs or subparagraphs titled "Basis-of-Design" are included and also introduce or refer to a list of manufacturers' names, provide either the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
      a. Substitutions may be considered, unless otherwise indicated.

2.2 COMPARABLE PRODUCTS

A. Where products or manufacturers are specified by name, submit the following, in addition to other required submittals, to obtain approval of an unnamed product:
   1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.

2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01616 - VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS

PART 1 GENERAL

1.1 SECTION INCLUDES
- A. Requirement for installer certification that they did not use any non-compliant products.
- B. VOC restrictions for product categories listed below under "DEFINITIONS."
- C. All products of each category that are installed in the project must comply; Hillsborough County Sheriff's Office's project goals do not allow for partial compliance.

1.2 RELATED REQUIREMENTS
- A. Section 01300 - Administrative Requirements: Submittal procedures.

1.3 DEFINITIONS
- A. VOC-Restricted Products: All products of each of the following categories when installed or applied on-site in the building interior:
  1. Adhesives, sealants, and sealer coatings.
  2. Carpet.
  3. Carpet tile.
  4. Paints and coatings.
  5. Insulation.
  6. Gypsum board.
  7. Other products when specifically stated in the specifications.
- B. Interior of Building: Anywhere inside the exterior weather barrier.
- C. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.
- D. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.

1.4 REFERENCE STANDARDS
- A. CRI (GLP) - Green Label Plus Testing Program - Certified Products; Carpet and Rug Institute.
- B. Green Seal GS-11; Paints; Second Edition; May 12, 2008.
- C. Green Seal Standard GC-11, Anti-Corrosive Paints, Second Edition, May 12, 2008.
- D. South Coast Air Quality Management District (SCAQMD) Rule 1113, Architectural Coatings, rules as amended July 13, 2007
- E. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; www.aqmd.gov.

1.5 SUBMITTALS
- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Evidence of Compliance: Submit for each different product in each applicable category.
- C. Product Data: For each VOC-restricted product used in the project, submit evidence of compliance.
- D. Installer Certifications Regarding Prohibited Content: Require each installer of any type of product (not just the products for which VOC restrictions are specified) to certify that either 1) no adhesives, joint sealants, paints, coatings, or composite wood or agrifiber products have been used in the installation of his products, or 2) that such products used comply with these requirements.

1.6 QUALITY ASSURANCE
- A. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 PRODUCTS

2.1 MATERIALS
- A. All VOC-Restricted Products: Provide products having VOC content of types and volume not greater than those specified in State of California Department of Health Services Standard Practice for the Testing of Volatile Organic Emissions From Various Sources Using Small-Scale Environmental Chambers.
  1. Evidence of Compliance: Acceptable types of evidence are:
     - a. Current GREENGUARD Children & Schools certification; www.greenguard.org.
     - b. Current Carpet and Rug Institute Green Label Plus certification; www.carpet-rug.org.
     - c. Current SCS Indoor Advantage Gold certification; www.scscertified.com.
     - d. Product listing in the CHPS Low-Emitting Materials Product List at www.chps.net/manual/lem_table.htm.
     - e. Current certification by any other agencies acceptable to CHPS.

f. Report of laboratory testing performed in accordance with CHPS requirements for getting a product listed in the Low-Emitting Materials Product List; report must include laboratory's statement that the product meets the specified criteria.

2. Product data submittals showing VOC content are NOT acceptable forms of evidence.

B. Adhesives and Joint Sealants: Provide only products having volatile organic compound (VOC) content not greater than required by South Coast Air Quality Management District Rule No.1168.
   1. Evidence of Compliance: Acceptable types of evidence are:
      a. Report of laboratory testing performed in accordance with requirements.

C. Aerosol Adhesives: Provide only products having volatile organic compound (VOC) content not greater than required by GreenSeal GS-36.
   1. Evidence of Compliance: Acceptable types of evidence are:
      a. Current GreenSeal Certification.

D. Paints and Coatings:
   1. Provide paints, coatings, and primers that do not exceed the VOC limits established in Green Seal Standard GS-11; Paints; Second Edition; May 12, 2008:
      a. Flats: 50g/L.
      b. Non-Flats: 100 g/L.
      c. Anti-corrosive and anit-rust paints applied to interior walls and ceilings:
         1) Do not exceed the VOC content limits of 250 g/L established in the Green Seal Standard GC-11, Anti-Corrosive Paints, Second Edition, May 12, 2008.
   2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
   3. Evidence of Compliance: Acceptable types of evidence are:
      a. Report of laboratory testing performed in accordance with requirements.
      b. Published product data showing compliance with requirements.
      c. Certification by manufacturer that product complies with requirements.

E. Carpet and Adhesive: Provide products having VOC content not greater than that required for CRI Green Label Plus certification.
   1. Evidence of Compliance: Acceptable types of evidence are:
      a. Current Green Label Plus Certification.
      b. Report of laboratory testing performed in accordance with requirements.

F. Carpet Tile and Adhesive: Provide products having VOC content not greater than that required for CRI Green Label Plus certification.
   1. Evidence of Compliance: Acceptable types of evidence are:
      a. Current Green Label Plus Certification.
      b. Report of laboratory testing performed in accordance with requirements.
      c. Current SCS "No Added Urea Formaldehyde" certification; www.scscertified.com.
      d. Certification by manufacturer that product complies with requirements.

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

A. Hillsborough County Sheriff's Office reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to Hillsborough County Sheriff's Office.

B. Additional costs to restore indoor air quality due to installation of non-compliant products will be borne by Contractor.

END OF SECTION

SECTION 01700 - EXECUTION REQUIREMENTS

PART 1 - GENERAL

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

1.2 SUMMARY
- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
  1. Construction layout.
  2. General installation of products.
  3. Progress cleaning.
  4. Starting and adjusting.
  5. Protection of installed construction.
  6. Correction of the Work.
- B. Related Sections include the following:
  1. Division 1 Section "Project Management and Coordination" for procedures for coordinating field engineering with other construction activities.
  2. Division 1 Section "Cutting and Patching" for procedural requirements for cutting and patching necessary for the installation or performance of other components of the Work.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 ENERGY EFFICIENT AND SUSTAINABLE BUILDINGS
- A. All county, municipal, school district, water management district, state university, community college, and state court buildings shall be constructed to comply with a sustainable building rating system or a national model green building code.

3.2 EXAMINATION
- A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.
- B. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
  1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
     a. Description of the Work.
     b. List of detrimental conditions, including substrates.
     c. List of unacceptable installation tolerances.
     d. Recommended corrections.
  2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
  3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
  4. Examine walls, floors, slabs, existing structural elements, and adjacent finishes where products and systems are to be installed.
  5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.3 PREPARATION
- A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.4 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
   1. Make vertical work plumb and make horizontal work level.
   2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
   3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
F. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
   1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
G. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
H. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.5 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
   1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
   2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.
   3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
B. Site: Maintain Project site free of waste materials and debris.
C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
   1. Remove liquid spills promptly.
   2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
G. Cutting and Patching: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.
   1. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.
H. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
I. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
J. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

K. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.6 STARTING AND ADJUSTING

A. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.
B. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
C. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 1 Section "Quality Requirements."

3.7 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.8 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 1 Section "Cutting and Patching."
   1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
B. Restore permanent facilities used during construction to their specified condition.
C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION

SECTION 01731 - CUTTING AND PATCHING

PART 1 - GENERAL

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

1.2 SUMMARY
- A. This Section includes procedural requirements for cutting and patching.
- B. Related Sections include the following:
  1. Divisions 2 through 16 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.
     a. Requirements in this Section apply to mechanical and electrical installations. Refer to Divisions 15 and 16 Sections for other requirements and limitations applicable to cutting and patching mechanical and electrical installations.

1.3 DEFINITIONS
- A. Cutting: Removal of existing construction necessary to permit installation or performance of other Work.
- B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.4 SUBMITTALS
- A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:
  1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
  2. Changes to Existing Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
  3. Products: List products to be used and firms or entities that will perform the Work.
  4. Dates: Indicate when cutting and patching will be performed.
  5. Utilities: List utilities that cutting and patching procedures will disturb or affect. List utilities that will be relocated and those that will be temporarily out of service. Indicate how long service will be disrupted.
  6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
  7. Architect's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.5 QUALITY ASSURANCE
- A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
  1. Structural concrete.
  2. Structural steel.
  3. Lintels.
  4. Miscellaneous structural metals.
  5. Equipment supports.
  6. Piping, ductwork, vessels, and equipment.
- B. Operational Elements: Do not cut and patch the following operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
  1. Primary operational systems and equipment.
  2. Air or smoke barriers.
  3. Fire-protection systems.
  4. Control systems.
  5. Communication systems.
  6. Conveying systems.
  7. Electrical wiring systems.
- C. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

PART 2 - PRODUCTS

2.1 MATERIALS
A. General: Comply with requirements specified in other Sections of these Specifications.

PART 3 - EXECUTION

3.1 EXAMINATION
A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION
A. Temporary Support: Provide temporary support of Work to be cut.
B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

3.3 PERFORMANCE
A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
1. Cut existing construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
B. Cutting: Cut existing construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
5. Proceed with patching after construction operations requiring cutting are complete.
C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
b. Where partitions have been removed at intersections with a partition to remain, patch and repair to provide an even and uniform finish, color, texture and appearance.
4. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

END OF SECTION

SECTION 01732 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- B. Related Sections include the following:
  1. Division 1 Section "Summary" for use of the premises and phasing requirements.
  2. Division 1 Section "Work Restrictions" for restrictions on use of the premises due to Owner or tenant occupancy.
  3. Division 1 Section "Temporary Facilities and Controls" for temporary construction and environmental-protection measures for selective demolition operations.
  4. Division 1 Section "Cutting and Patching" for cutting and patching procedures for selective demolition operations.

1.2 SUMMARY
- A. This Section includes the following:
  1. Demolition and removal of selected portions of a building or structure.
  2. Repair procedures for selective demolition operations.

1.3 DEFINITIONS
- A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Detach items from existing construction and deliver them to Owner.
- C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP
- A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, demolished materials shall become Contractor's property and shall be removed from Project site.

1.5 SUBMITTALS
- A. Proposed Dust-Control and Noise-Control Measures: Submit statement or drawing that indicates the measures proposed for use, proposed locations, and proposed time frame for their operation. Identify options if proposed measures are later determined to be inadequate.
- B. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.
- C. Predemolition Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by selective demolition operations. Submit before Work begins.

1.6 QUALITY ASSURANCE
- A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.
- B. Professional Engineer Qualifications: Comply with Division 1 Section "Quality Requirements."
- C. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- D. Standards: Comply with ANSI A10.6 and NFPA 241.
- E. Predemolition Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."
- F. Inspections: Design Team, Contractor, and Owner shall inspect areas slated for demolition prior to commencement of demolition (after utilities are disconnected) and after demolition is complete.

1.7 PROJECT CONDITIONS
- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.
- B. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.

1. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from authorities having jurisdiction.
2. Owner assumes no responsibility for condition of areas to be selectively demolished.
   a. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
3. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
4. Storage or sale of removed items or materials on-site will not be permitted.
5. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
   a. Maintain fire-protection facilities in service during selective demolition operations.

1.8 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 REPAIR MATERIALS

A. Use repair materials identical to existing materials.
   1. If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
   2. Use materials whose installed performance equals or surpasses that of existing materials.
   3. Comply with material and installation requirements specified in individual Specification Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped.
B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.
E. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES

A. Existing Utilities: Maintain services indicated to remain and protect them against damage during selective demolition operations.
B. Do not interrupt existing utilities serving occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to authorities having jurisdiction.
   1. Provide at least 72 hours' notice to Owner if shutdown of service is required during changeover.
   2. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utilities serving areas to be selectively demolished.
      a. Arrange to shut off indicated utilities with utility companies.
      b. If utility services are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary utilities that bypass area of selective demolition and that maintain continuity of service to other parts of building.
      c. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.

3.3 PREPARATION

A. Dangerous Materials: Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with selective demolition operations.
B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
   1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
   2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.

3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Temporary Enclosures: Provide temporary enclosures for protection of existing building and construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities.
   a. Where heating or cooling is needed and permanent enclosure is not complete, provide insulated temporary enclosures. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.
6. Temporary Partitions: Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.

3.4 POLLUTION CONTROLS

A. Dust Control: Use temporary enclosures, and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations.
   1. Do not use water mist.
   2. Seal duct openings to prevent dust contamination.
   3. Wet mop floors to eliminate trackable dirt and wipe down walls and doors of demolition enclosure. Vacuum carpeted areas.
   4. Disposal: Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
      a. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
   5. Cleaning: Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

3.5 SELECTIVE DEMOLITION

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
   1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
   2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
   3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
   4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
   5. Maintain adequate ventilation when using cutting torches.
   6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
   7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
   8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
   9. Dispose of demolished items and materials promptly.
   10. Return elements of construction and surfaces that are to remain to condition existing before selective demolition operations began.
   11. Existing Facilities: Comply with Owner's requirements for using and protecting elevators, stairs, walkways, loading docks, building entries, and other building facilities during selective demolition operations.
   12. Removed and Salvaged Items. Comply with the following:
      a. Clean salvaged items.
      b. Store items in a secure area until delivery to Owner.
      c. Transport items to storage area on-campus.
      d. Protect items from damage during transport and storage.
   13. Removed and Reinstalled Items: Comply with the following:

a. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
b. Protect items from damage during transport and storage.
c. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

14. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and reinstalled in their original locations after selective demolition operations are complete.

3.6 PATCHING AND REPAIRS
A. General: Promptly repair damage to adjacent construction caused by selective demolition operations.
B. Patching: Comply with Division 1 Section "Cutting and Patching."

3.7 DISPOSAL OF DEMOLISHED MATERIALS
A. General: Promptly remove demolished materials. Do not allow demolished materials to accumulate on-site.
1. Burning: Do not burn demolished materials.
2. Recycling: All demolished items shall be transported to a recycling facility for processing.

3.8 SCHEDULE OF SALVAGED ITEMS
A. The Architect intends to require the salvage and reuse of the following items (including but not limited to):
1. Existing doors, frames and hardware.
2. Existing fire extinguishers and extinguisher cabinets.
3. Existing mechanical diffusers.

END OF SECTION

SECTION 01770 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
- B. Related Sections include the following:
  1. Division 1 Section "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
  2. Division 1 Section "Execution Requirements" for progress cleaning of Project site.
  3. Divisions 2 through 16 Sections for specific closeout and special cleaning requirements for products of those Sections.

1.2 SUMMARY
- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
  1. Inspection procedures.
  2. Project Record Documents.
  3. Operation and maintenance manuals.
  4. Warranties.
  5. Instruction of Owner's personnel.
  6. Final cleaning.

1.3 SUBSTANTIAL COMPLETION
- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
  1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
  2. Advise Owner of pending insurance changeover requirements.
  3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
  4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
  5. Prepare and submit Project Record Documents, operation and maintenance manuals, and similar final record information.
  6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
  7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
  8. Complete startup testing of systems.
  9. Submit test/adjust/balance records.
  10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
  11. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
  12. Complete final cleaning requirements, including touchup painting.
  13. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
  14. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
     a. Multiple Inspections: The Architect’s Agreement with the Owner includes one Substantial Completion Inspection for the entire project.
        1) If the Contractor wants additional Inspections, they will be conducted at the Contractor’s expense. Cost of multiple Substantial Completion Inspections will be billed at the Architect’s and Engineers’ hourly rates as identified in the Architect Owner Agreement.
        2) Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
           (a) The Architect’s Agreement with the Owner includes one reinspection to determine if the Substantial Completion Punch List has been completed. Cost of more that one reinspection

will be at the Contractor's expense and will be billed at the Architect's and Engineers' hourly rates as identified in the Architect Owner Agreement.

3) Results of completed inspection will form the basis of requirements for Final Completion.

1.4 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
   1. Submit a final Application for Payment according to Division 1 Section "Payment Procedures."
   2. Submit copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed by Construction Manager. The copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
   3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
   4. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
   5. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
      a. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
         1) The Architect's Agreement with the Owner includes one inspection to determine Final Completion. Cost of more that one inspection will be at the Contractor's expense and will be billed at the Architect's and Engineers' hourly rates.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
   1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
   2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
   3. Include the following information at the top of each page:
      a. Project name.
      b. Date.
      c. Name of Architect and Construction Manager.
      d. Page number.

1.6 PROJECT RECORD DOCUMENTS

A. General: Do not use Project Record Documents for construction purposes. Protect Project Record Documents from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

B. Record Drawings: Maintain and submit one set of blue- or black-line white prints of Contract Drawings and Shop Drawings.
   1. Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
      a. Give particular attention to information on concealed elements that cannot be readily identified and recorded later.
      b. Accurately record information in an understandable drawing technique.
      c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
      d. Mark Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. Where Shop Drawings are marked, show cross-reference on Contract Drawings.
         1) Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.
         2) Mark important additional information that was either shown schematically or omitted from original Drawings.
         3) Note Construction Change Directive numbers, Change Order numbers, alternate numbers, and similar identification where applicable.

4) Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location. Organize into manageable sets; bind each set with durable paper cover sheets. Include identification on cover sheets.

e. At the completion of construction, finalize the Record Drawings. Provide Architect an electronic scanned version of the complete Contract Documents (including all Addenda, Change Orders, CCDs, and Owner Contingency Adjustment Authorizations). Scans of the set must be in color, bookmarked pdfs, with a minimum resolution of 200 dpi.

f. A CD-ROM containing AutoCAD drawing files is to be included in Close-out package. Files are to include all as-built changes. Bind external references to final drawings.

2. Record Specifications: Submit one copy of Project's Specifications, including addenda and contract modifications. Mark copy to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
   a. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
   b. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
   c. Note related Change Orders, Record Drawings, and Product Data, where applicable.
   d. At the completion of construction, finalize the Record Specifications. Provide Architect an electronic scanned version of the complete Project Specifications (including all Addenda, Change Orders, CCDs, and Owner Contingency Adjustment Authorizations). Scans of the specifications must be in color, bookmarked pdfs, with a minimum resolution of 200 dpi.

1.7 WARRANTIES

A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
   1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
   2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
   3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
   4. Provide additional copies of each warranty to include in operation and maintenance manuals.

1.8 EXTRA STOCK REQUIREMENTS

A. Extra stock materials are to be provided.
   1. Each Finish paint type and color – 1 Gallon Each.
   2. Vinyl floor primary type – 5 boxes.
   3. Ceiling Tile - 5 boxes.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 DEMONSTRATION AND TRAINING

A. Instruction: Instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system. Complete log of activities.
   1. Provide instructors experienced in operation and maintenance procedures.
   2. Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.
   3. Schedule training with Owner, with at least seven days' advance notice.
   4. Coordinate instructors, including providing notification of dates, times, length of instruction, and course content.
   5. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections. For each training module, develop a learning objective and teaching outline. Include instruction for the following:

a. System design and operational philosophy.
b. Review of documentation.
c. Operations.
d. Adjustments.
e. Troubleshooting.
f. Maintenance.
g. Repair.

3.2 FINAL CLEANING

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:
   a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
   b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
   c. Remove tools, construction equipment, machinery, and surplus material from Project site.
   d. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
   e. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
   f. Sweep concrete floors broom clean in unoccupied spaces.
   g. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
   h. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
   i. Remove labels that are not permanent.
   j. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
      1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
         (a) Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
         (b) Replace parts subject to unusual operating conditions.
         (c) Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
         (d) Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
         (e) Clean ducts, blowers, and coils if units were operated without filters during construction.
         (f) Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
         (g) Leave Project clean and ready for occupancy.
2. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

3.3 CLOSE OUT CHECKLIST

A. Provide information as required by Hillsborough County Sheriff's Department.

END OF SECTION

SECTION 06100 - ROUGH CARPENTRY

PART 1 GENERAL

1.1 SECTION INCLUDES
- A. Concealed wood blocking, nailers, and supports.

1.2 RELATED REQUIREMENTS
- A. Section 01616 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 09260 - Gypsum Board Assemblies: Gypsum-based sheathing.

1.3 REFERENCE STANDARDS
- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- C. PS 20 - American Softwood Lumber Standard; National Institute of Standards and Technology, Department of Commerce.
- D. SPIB (GR) - Grading Rules; Southern Pine Inspection Bureau, Inc..

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS
- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
  1. Species: Douglas Fir-Larch, unless otherwise indicated.
  2. If no species is specified, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.
  3. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
- B. Lumber fabricated from old growth timber is not permitted.
- C. Provide sustainably harvested wood; see Section 01600 for requirements.

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

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

2.4 ACCESSORIES
- A. Fasteners and Anchors:
  1. Metal and Finish: Hot-dipped galvanized steel per ASTM A 153/A 153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.

PART 3 EXECUTION

3.1 INSTALLATION - GENERAL
- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

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

3.3 INSTALLATION OF CONSTRUCTION PANELS
- A. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches on center on all edges and into studs in field of board.
  1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
  2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.

3. Install adjacent boards without gaps.

3.4 CLEANING

A. Waste Disposal: Comply with the requirements of Section 01732.
   1. Comply with applicable regulations.
   2. Do not burn scrap on project site.
   3. Do not burn scraps that have been pressure treated.
   4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

B. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.

C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION

SECTION 06415 - COUNTERTOPS

PART 1 GENERAL

1.1 SECTION INCLUDES
- A. Countertops for Toilet Room lavatories.

1.2 RELATED REQUIREMENTS
- A. Section 15410 - Plumbing Fixtures: Sinks.

1.3 REFERENCE STANDARDS
- A. ANSI Z124.3 - American National Standard for Plastic Lavatories.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards.
- D. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; International Surface Fabricators Association.
- E. ISFA 3-01 - Classification and Standards for Solid Surfacing Material; International Surface Fabricators Association.
- F. NEMA LD 3 - High-Pressure Decorative Laminates.

1.4 SUBMITTALS
- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
  1. Preparation instructions and recommendations.
  2. Storage and handling requirements and recommendations.
  3. Specimen warranty.
- C. Shop Drawings: Complete details of materials and installation; combine with shop drawings of cabinets and casework specified in other sections.
- D. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.
- E. Test Reports: Chemical resistance testing, showing compliance with specified requirements.

1.5 QUALITY ASSURANCE

PART 2 PRODUCTS

2.1 COUNTERTOP ASSEMBLIES
- A. Quality Standard: See Section 06410.
- B. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.
  1. Flat Sheet Thickness: 3/4 inch, minimum.
  2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
     a. Surface Burning Characteristics: Flame spread 25, maximum; smoke developed 450, maximum; when tested in accordance with ASTM E84.
     b. Sinks and Bowls: Separate units for undercounter mounting; minimum 3/4 inch wall thickness; comply with ANSI Z124.3.
     c. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
     d. Color and Pattern: As selected by Wilder Architecture, Inc. from manufacturer's full line.
     e. Manufacturers:
        1) Dupont; _____: www.corian.com.
        2) Formica Corporation; _____: www.formica.com.
        3) Wilsonart, LLC; _____: www.wilsonart.com.
        4) Substitutions: See Section 01600 - Product Requirements.
  3. Other Components Thickness: 3/4 inch, minimum.
  4. Exposed Edge Treatment: Built up to minimum 1-1/4 inch thick; square edge; use marine edge at sinks.
  5. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.
  6. Skirts: As indicated on drawings.
  7. Fabricate in accordance with AWI/AWMAC/WI (AWS), Section 11 - Countertops, Custom Grade.

2.2 ACCESSORY MATERIALS
- A. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.
- B. Joint Sealant: Mildew-resistant silicone sealant, color to match adjacent surfaces..

2.3 FABRICATION
- A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.
  1. Join lengths of tops using best method recommended by manufacturer.
  2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.
  3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.
- B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
  1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
  2. Height: 4 inches, unless otherwise indicated.
- C. Solid Surfacing: Fabricate tops up to 144 inches long in one piece; join pieces with adhesive sealant in accordance with manufacturer's recommendations and instructions.

PART 3 EXECUTION

3.1 EXAMINATION
- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Wilder Architecture, Inc. of unsatisfactory preparation before proceeding.
- C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.2 PREPARATION
- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION
- A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.
- B. Seal joint between back/end splashes and vertical surfaces.

3.4 TOLERANCES
- A. Variation From Horizontal: 1/8 inch in 10 feet, maximum.
- B. Offset From Wall, Countertops: 1/8 inch maximum; 1/16 inch minimum.
- C. Field Joints: 1/8 inch wide, maximum.

3.5 CLEANING

3.6 PROTECTION
- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 07210 - BUILDING INSULATION

PART 1 - GENERAL

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

1.2 SUMMARY
- A. This Section includes the following:
  1. Concealed building insulation.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  1. Division 9 Section "Gypsum Board Assemblies" for insulation installed as part of metal-framed wall and partition assemblies.

1.3 SUBMITTALS

1.4 QUALITY ASSURANCE
- A. Source Limitations: Obtain each type of building insulation through one source.
- B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated on Drawings or specified elsewhere in this Section as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
  1. Surface-Burning Characteristics: ASTM E 84.
  2. Fire-Resistance Ratings: ASTM E 119.

1.5 DELIVERY, STORAGE, AND HANDLING
- A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

PART 2 - PRODUCTS

2.1 INSULATING MATERIALS
- A. General: Provide insulating materials that comply with requirements and with referenced standards.
  1. Preformed Units: Sizes to fit applications indicated; selected from manufacturer's standard thicknesses, widths, and lengths with mold resistance properties.
- B. Unfaced, Glass-Fiber Board Insulation: Thermal insulation combining glass fibers with thermosetting resin binders to comply with ASTM C 612, Type IA and IB; and with other requirements indicated below:
  1. Nominal density of 3 lb/cu. ft., thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F.
  2. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indices of 25 and 50, respectively.

2.2 SAFING INSULATION AND ACCESSORIES
- A. Slag-Wool-Fiber Board Safing Insulation: Semirigid boards designed for use as fire stop at openings between edge of slab and exterior wall panels, produced by combining slag-wool fibers with thermosetting resin binders to comply with ASTM C 612, Type IA and IB; nominal density of 4 lb/cu. ft.; passing ASTM E 136 for combustion characteristics; thermal resistivity of 4 deg F x h x sq. ft./Btu x in. at 75 deg F.
- B. Calking Compound: Material approved by manufacturer of safing insulation for sealing joint between foil backing of safing insulation and edge of concrete floor slab against penetration of smoke.
- C. Safing Clips: Galvanized steel safing clips approved by manufacturer of safing insulation for holding safing insulation in place.

2.3 AUXILIARY INSULATING MATERIALS
- A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.

PART 3 - EXECUTION

3.1 EXAMINATION
- A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and to determine if other conditions affecting performance of

insulation are satisfactory. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders or that interfere with insulation attachment.

3.3 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.
B. Install insulation that is undamaged, dry, unsoiled, and has not been exposed at any time to ice and snow.
C. 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.
D. Apply single layer of insulation to produce thickness indicated.

3.4 INSTALLATION OF GENERAL BUILDING INSULATION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
B. Seal joints between closed-cell (non-breathing) insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.
C. Install mineral-fiber blankets in cavities formed by framing members according to the following requirements:
    1. Use blanket widths and lengths that fill cavities formed by framing members. Where more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
    2. Place blankets in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
D. Stuff glass-fiber loose-fill insulation into miscellaneous voids and cavity spaces where shown. Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft..

3.5 INSTALLATION OF SAFING INSULATION

A. Install safing insulation to fill gap between edge of concrete floor slab and back of exterior spandrel panels on safing clips spaced as needed to support insulation, but not further apart than 24 inches o.c. Cut safing insulation wider than gap to be filled to ensure compression fit and seal joint between insulation and edge of slab with calking approved by safing insulation manufacturer for this purpose. Leave no voids in completed installation.

3.6 PROTECTION

A. General: Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION

SECTION 07841 - THROUGH-PENETRATION FIRESTOP SYSTEMS

PART 1 - GENERAL

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

1.2 SUMMARY
- A. This Section includes through-penetration firestop systems for penetrations through the following fire-resistance-rated assemblies, including both empty openings and openings containing penetrating items:
  1. Walls and partitions.
- B. Related Sections include the following:
  1. Division 7 Section "Building Insulation" for safing insulation and accessories.
  2. Division 15 Sections specifying duct and piping penetrations.
  3. Division 16 Sections specifying cable and conduit penetrations.

1.3 PERFORMANCE REQUIREMENTS
- A. General: For the following constructions, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assembly penetrated.
  1. Fire-resistance-rated non-load-bearing walls, including partitions, with fire-protection-rated openings.
  2. Fire-resistance-rated floor assemblies.
- B. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that after curing do not deteriorate when exposed to these conditions both during and after construction.
  1. For piping penetrations for plumbing provide moisture-resistant through-penetration firestop systems.
  2. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.
- C. For through-penetration firestop systems exposed to view, provide products with flame-spread ratings of less than 25 and smoke-developed ratings of less than 450, as determined per ASTM E 84.

1.4 SUBMITTALS
- A. Product Data: For each type of through-penetration firestop system product indicated.
- B. Product Certificates: Signed by manufacturers of through-penetration firestop system products certifying that products furnished comply with requirements.

1.5 QUALITY ASSURANCE
- A. Installer Qualifications: An experienced installer who has completed through-penetration firestop systems similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, from a single manufacturer.
- C. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in "Performance Requirements" Article:
  1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
  2. Through-penetration firestop systems are identical to those tested per ASTM E 814. Provide rated systems complying with the following requirements:.
     a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
     b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by the following:
        1) UL in "Fire Resistance Directory."

1.6 DELIVERY, STORAGE, AND HANDLING
- A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; lot number; shelf life, if applicable; qualified testing and inspecting agency's classification marking applicable to Project; curing time; and mixing instructions for multicomponent materials.
- B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.7 PROJECT CONDITIONS
A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

1.8 COORDINATION
A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.
B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.

PART 2 - PRODUCTS

2.1 FIRESTOPPING, GENERAL
A. Compatibility: Provide through-penetration firestop systems that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.
B. Firestopping Sealants: Provide only products having lower volatile organic compound (VOC) content than required by South Coast Air Quality Management District Rule No.1168.
C. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by the qualified testing and inspecting agency for firestop systems indicated. Accessories include, but are not limited to, the following items:
1. Permanent forming/damming/backing materials, including the following:
a. Slag-/rock-wool-fiber insulation.
b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
c. Fire-rated form board.
d. Fillers for sealants.
2. Temporary forming materials.
a. Substrate primers.
b. Collars.
c. Steel sleeves.

2.2 FILL MATERIALS
A. General: Provide through-penetration firestop systems containing the types of fill materials indicated in the Through-Penetration Firestop System Schedule at the end of Part 3 by reference to the types of materials described in this Article. Fill materials are those referred to in directories of the referenced testing and inspecting agencies as fill, void, or cavity materials.
B. Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.
C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized steel sheet.
E. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
G. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
H. Silicone Sealants: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces and nonsag formulation for openings in vertical and other surfaces requiring a nonslumping, gunnable sealant, unless indicated firestop system limits use to nonsag grade for both opening conditions.

2.3 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.

PART 3 - EXECUTION

3.1 EXAMINATION
- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION
- A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with written recommendations of firestop system manufacturer and the following requirements:
  1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.
  2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.
  3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.3 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION
- A. General: Install through-penetration firestop systems to comply with "Performance Requirements" Article and firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
- C. Install fill materials for firestop systems by proven techniques to produce the following results:
  1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
  2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
  3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 CLEANING AND PROTECTION
- A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce through-penetration firestop systems complying with specified requirements.

3.5 THROUGH-PENETRATION FIRESTOP SYSTEM SCHEDULE
- A. Where UL-classified systems are indicated, they refer to the alpha-alpha-numeric designations listed in UL's "Fire Resistance Directory" under product Category XHEZ.
- B. Firestop Systems with No Penetrating Items: Comply with the following:
  1. Type of Fill Materials: One or more of the following:
     a. Latex sealant.
     b. Silicone sealant.
     c. Intumescent putty.
- C. Firestop Systems for Metallic Pipes, Conduit, or Tubing: Comply with the following:
  1. Type of Fill Materials: One or more of the following:
     a. Latex sealant.
     b. Silicone sealant.
     c. Intumescent putty.

D. Firestop Systems for Nonmetallic Pipe, Conduit, or Tubing FS: Comply with the following:
   1. Type of Fill Materials: One or more of the following:
      a. Latex sealant.
      b. Silicone sealant.
      c. Intumescent putty.
      d. Intumescent wrap strips.
      e. Firestop device.
E. Firestop Systems for Electrical Cables: Comply with the following:
   1. Type of Fill Materials: One or more of the following:
      a. Latex sealant.
      b. Silicone sealant.
      c. Intumescent putty.
      d. Silicone foam.
F. Firestop Systems for Insulated Pipes: Comply with the following:
   1. Type of Fill Materials: One or more of the following:
      a. Latex sealant.
      b. Intumescent putty.
      c. Silicone foam.
      d. Intumescent wrap strips.
G. Firestop Systems for Miscellaneous Electrical Penetrants: Comply with the following:
   1. Type of Fill Materials: One or more of the following:
      a. Latex sealant.
      b. Intumescent putty.
H. Firestop Systems for Miscellaneous Mechanical Penetrations: Comply with the following:
   1. Type of Fill Materials: One or both of the following:
      a. Latex sealant.
I. Firestop Systems for Groupings of Penetrations: Comply with the following:
   1. Type of Fill Materials: One or more of the following:
      a. Latex sealant.
      b. Intumescent wrap strips.
      c. Firestop device.
      d. Intumescent composite sheet.

END OF SECTION

SECTION 07900 - JOINT SEALERS

PART 1 GENERAL

1.1 SECTION INCLUDES
- A. Sealants and joint backing.
- B. Precompressed foam sealers.

1.2 RELATED REQUIREMENTS
- A. Section 01616 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 09260 - Gypsum Board Assemblies.

1.3 REFERENCE STANDARDS
- A. ASTM C834 - Standard Specification for Latex Sealants.
- B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
- C. ASTM C1193 - Standard Guide for Use of Joint Sealants.
- D. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; www.aqmd.gov.

1.4 ADMINISTRATIVE REQUIREMENTS
- A. Coordinate the work with other sections referencing this section.

1.5 SUBMITTALS
- A. See Section 01330 - Submittal Requirements.
- B. Product Data: Provide data indicating sealant chemical characteristics.

1.6 QUALITY ASSURANCE
- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.7 FIELD CONDITIONS
- A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS
- A. Gunnable and Pourable Sealants:
  1. Dow Corning Corporation: www.dowcorning.com.
  2. Pecora Corporation: www.pecora.com.
  3. Tremco Global Sealants: www.tremcosealants.com.

2.2 SEALANTS
- A. Sealants and Primers - General: Provide products having volatile organic compound (VOC) content as specified in Section 01616.
- B. Type EX-1 - General Purpose Exterior Sealant: Polyurethane or High-Performance Silicone Sealant; ASTM C920, Type S, Grade NS, Class 50 minimum; Uses NT, M, G, A and O ; medium modulus, single component.
  1. Color: Match adjacent finished surfaces.
  2. Applications: Use for:
     a. Joints between concrete and other materials.
     b. Joints between metal frames and other materials.
     c. Storefront joints.
     d. Other exterior joints for which no other sealant is indicated.
- C. Type EX-2 - Exterior Expansion Joint Sealer: [High-Performance Silicone Sealant]; ASTM C920, Type S, Grade NS, Class 100/50 minimum; Uses NT, M, G, A and O ; ultra-low modulus, single component.
  1. Color; Standard colors matching finished adjacent surfaces.
  2. Applications: Use for:
     a. Exterior tilt-wall expansion joints.
  3. Products:
     a. Tremco Global Sealants; Spectrum 1: www.tremcosealants.com.
     b. Substitutions: See Section 01600 - Product Requirements.
- D. Type IN-1 - General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C834, Type OP, Grade NF single component, paintable.
  1. Color: To be selected by Wilder Architecture, Inc. from manufacturer's standard range.
  2. Applications: Use for:
     a. Interior wall and ceiling control joints.

b. At ceiling perimeter trim and wall surfaces.
c. Joints between door and window frames and wall surfaces.
d. Other interior joints for which no other type of sealant is indicated.

3. Product: Tremflex Siliconized Acrylic Latex Sealant manufactured by Tremco, Inc.
a. Substitutions: See Section 01600 - Product Requirements.

E. Type IN-2 - Bathtub/Tile Sealant: White silicone; ASTM C920, Uses I, M and A; single component, mildew resistant.
1. Applications: Use for:
a. Joints between plumbing fixtures and floor and wall surfaces.
b. Joints between kitchen and bath countertops and wall surfaces.
2. Products:
a. Tremco Global Sealants; ____: www.tremcosealants.com.
b. Substitutions: See Section 01600 - Product Requirements.

PART 3 EXECUTION

3.1 EXAMINATION
A. Verify that substrate surfaces are ready to receive work.
B. Verify that joint backing and release tapes are compatible with sealant.

3.2 PREPARATION
A. Remove loose materials and foreign matter that could impair adhesion of sealant.
B. Clean and prime joints in accordance with manufacturer's instructions.
C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.
D. Protect elements surrounding the work of this section from damage or disfigurement.

3.3 INSTALLATION
A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
B. Perform installation in accordance with ASTM C1193.
C. Install bond breaker where joint backing is not used.
D. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
E. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
F. Tool joints concave.
G. Precompressed Foam Sealant: Do not stretch; avoid joints except at corners, ends, and intersections; install with face 1/8 to 1/4 inch below adjoining surface.

3.4 CLEANING
A. Clean adjacent soiled surfaces.

3.5 PROTECTION
A. Protect sealants until cured.

3.6 SCHEDULE
A. Interior Joints for Which No Other Sealant Type is Indicated: Type IN-1.
B. Joints Between Plumbing Fixtures and Walls and Floors, and Between Countertops and Walls: Type IN-2.
C. Exterior Joints Between Metal Frames and Walls: Type EX-1.
D. Exterior Joints in Tilt-panel Walls: Type EX-2.

END OF SECTION

SECTION 08110 - STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Related Sections include the following:
  1. Division 8 Section "Flush Wood Doors" for wood doors installed in steel frames.
  2. Division 8 Section "Door Hardware" for door hardware and weather stripping.
  3. Division 8 Section "Glazing" for glass in glazed openings in doors and frames.
  4. Division 9 Section "Painting" for field painting factory-primed doors and frames.

1.2 SUMMARY
- A. This Section includes the following:
  1. Knocked-down steel door frames.
  2. Fully welded, bullet resistant frames.
  3. Fully welded, borrowed-light frames.
  4. Fire-rated door and frame assemblies.

1.3 DEFINITIONS
- A. Steel Sheet Thicknesses: Thickness dimensions, including those referenced in ANSI A250.8, are minimums as defined in referenced ASTM standards for both uncoated steel sheet and the uncoated base metal of metallic-coated steel sheets.

1.4 SUBMITTALS
- A. Product Data: For each type of door and frame indicated, include door designation, type, level and model, material description, core description, construction details, label compliance, sound and fire-resistance ratings, and finishes.
- B. Shop Drawings: Show the following:
  1. Elevations of each door design.
  2. Details of doors including vertical and horizontal edge details.
  3. Frame details for each frame type including dimensioned profiles.
  4. Details and locations of reinforcement and preparations for hardware.
  5. Details of each different wall opening condition.
  6. Details of anchorages, accessories, joints, and connections.
  7. Coordination of glazing frames and stops with glass and glazing requirements.
- C. Door Schedule: Submit schedule of doors and frames using same reference numbers for details and openings as those on Contract Drawings.
- D. Oversize Construction Certificates: For door assemblies required to be fire-protection rated and exceeding size limitations of labeled assemblies.

1.5 QUALITY ASSURANCE
- A. Steel Door and Frame Standard: Comply with ANSI A 250.8, unless more stringent requirements are indicated.
- B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252.
  1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a testing agency acceptable to authorities having jurisdiction that doors conform to all standard construction requirements of tested and labeled fire-rated door assemblies except for size.

1.6 DELIVERY, STORAGE, AND HANDLING
- A. 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.
- B. Inspect doors and frames on delivery for damage. Minor damages may be repaired provided refinished items match new work and are acceptable to Architect; otherwise, remove and replace damaged items as directed.
- C. Store doors and frames at building site under cover. Place units on minimum 4-inch high wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber. If door packaging becomes wet, remove cartons immediately. Provide minimum 1/4-inch spaces between stacked doors to permit air circulation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cold-Rolled Steel Sheets: Carbon steel complying with ASTM A 366 (ASTM A 366M), commercial quality, or ASTM A 620 (ASTM A 620M), drawing quality, special killed.
B. Galvanized Steel Sheets: Zinc-coated carbon steel complying with hot-dip galvanized according to ASTM A 525, with A 60 (Galvanil) coating designation, mill phosphatized.
C. Supports and Anchors: Fabricated from not less than 0.0478-inch thick steel sheet; 0.0516-inch thick galvanized steel where used with galvanized steel frames.
D. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where items are to be built into exterior walls, hot-dip galvanize complying with ASTM A 153, Class C or D as applicable.

2.2 HOLLOW METAL FRAMES

A. General: Provide steel frames for doors, transoms, sidelights, borrowed lights, and other openings that comply with ANSI A250.8 (ANSI A250.11 for bulllet resistant frames) and with details indicated for type and profile. Conceal fastenings, unless otherwise indicated.
   1. Provide a bitumasitic coating on the concealed surfaces of interior and exterior frames.
B. Frames of 0.053-inch thick steel sheet for:
   1. Wood doors, unless otherwise indicated.
C. Door Silencers: Except on weather-stripped frames, fabricate stops to receive three silencers on strike jambs of single-door frames and two silencers on heads of double-door frames.
D. Plaster Guards: Provide 0.016-inch thick, steel sheet plaster guards or mortar boxes to close off interior of openings; place at back of hardware cutouts where mortar or other materials might obstruct hardware operation.
E. Supports and Anchors: Fabricated from not less than 0.042-inch thick, electrolytic zinc-coated or metallic-coated steel sheet.
   1. Wall Anchors in Existing Masonry Construction: Punched + Dimpled w/Welded Pipe & Strap Anchors and Expansion Bolts for Existing Masonry (Concrete) Opening, (having FL Product Approval at exterior locations).
F. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where zinc-coated items are to be built into exterior walls, comply with ASTM A 153/A 153M, Class C or D as applicable.

2.3 FABRICATION

A. General: Fabricate steel door and frame units to comply with ANSI A250.8 and to be rigid, neat in appearance, and free from defects including warp and buckle. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site.
B. Core Construction: One of the following manufacturer's standard core materials that produce a door complying with SDI standards:
   1. Polyurethane.
   2. Polystyrene.
C. Clearances for Non-Fire-Rated Doors: Not more than 1/8 inch at jambs and heads, except not more than 1/4 inch between pairs of doors. Not more than 3/4 inch at bottom.
D. Clearances for Fire-Rated Doors: As required by NFPA 80.
E. Fabricate concealed stiffeners, reinforcement, edge channels, louvers, and moldings from either cold- or hot-rolled steel sheet.
F. Exposed Fasteners: Unless otherwise indicated, provide countersunk flat or oval heads for exposed screws and bolts.
G. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware according to final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements in ANSI A250.6 and ANSI A115 Series specifications for door and frame preparation for hardware.
H. Door Frame Construction: Fabricate frames to shape shown.
   1. Knocked down, site assembled, steel door frames.
I. Lite Frame Construction: Fabricate frames to shape shown.
   1. Fabricate frames with mitered or coped and continuously welded corners, seamless face joints.
   2. Provide welded frames with temporary spreader bars.
J. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Project site.
K. Locate hardware as indicated on Shop Drawings or, if not indicated, according to ANSI A250.8.
L. Glazing Stops: Manufacturer's standard, formed from 0.032-inch thick steel sheet.

1. Provide nonremovable stops on outside of exterior doors and on secure side of interior doors for glass, louvers, and other panels in doors.
2. Provide screw-applied, removable, glazing stops on inside of glass, louvers, and other panels in doors.

M. Astragals: As required by NFPA 80 to provide fire ratings indicated.

2.4 FINISHES

A. Prime Finish: Manufacturer's standard, factory-applied coat of rust-inhibiting primer complying with ANSI A250.10 for acceptance criteria.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install steel doors, frames, and accessories according to Shop Drawings, manufacturer's data, and as specified.

B. Placing Frames: Comply with provisions of SDI 105, unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
   1. At existing concrete or masonry construction, install at least 3 completed opening anchors per jamb adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Set frames and secure to adjacent construction with bolts and masonry anchorage devices.
   2. In metal-stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels. In steel-stud partitions, attach wall anchors to studs with screws.
   3. Install fire-rated frames according to NFPA 80.
   4. At exterior frames or where frames will be grouted solid, back coat inside of frames with a bituminuos fibrous layer.

C. Door Installation: Comply with ANSI A250.8. Fit hollow-metal doors accurately in frames, within clearances specified in ANSI A250.8. Shim as necessary to comply with SDI 122 and ANSI/DHI A115.1G.
   1. Fire-Rated Doors: Install with clearances specified in NFPA 80.

3.2 ADJUSTING AND CLEANING

A. Prime Coat Touchup: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.

B. Protection Removal: Immediately before final inspection, remove protective wrappings from doors and frames.

END OF SECTION

SECTION 08211 - FLUSH WOOD DOORS

PART 1 - GENERAL

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

1.2 SUMMARY
- A. This Section includes the following:
  1. Solid-core doors with wood-veneer faces.

1.3 SUBMITTALS
- A. Product Data: For each type of door. Include details of core and edge construction, trim for openings, and louvers.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
  1. Indicate dimensions and locations of mortises and holes for hardware.
  2. Indicate dimensions and locations of cutouts.
  3. Indicate fire ratings for fire doors.

1.4 QUALITY ASSURANCE
- A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.
- B. Quality Standard: Comply with AWI's "Architectural Woodwork Quality Standards" for grade of door, core, construction, finish, and other requirements.
- C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.
  1. Test Pressure: Test at atmospheric pressure.
  2. Oversize, Fire-Rated Wood Doors: For door assemblies exceeding sizes of tested assemblies, provide oversize fire door label or certificate of inspection, from a testing and inspecting agency acceptable to authorities having jurisdiction, stating that doors comply with requirements of design, materials, and construction.

1.5 DELIVERY, STORAGE, AND HANDLING
- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in plastic bags or cardboard cartons.
- C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.6 PROJECT CONDITIONS
- A. Environmental Limitations: Do not deliver or install doors until conditions for temperature and relative humidity have been stabilized and will be maintained in storage and installation areas during the remainder of the construction period to comply with requirements of the referenced quality standard for Project's geographical location.

1.7 WARRANTY
- A. Special Warranty: Manufacturer's standard form, signed by manufacturer, Installer, and Contractor, in which manufacturer agrees to repair or replace doors that are defective in materials or workmanship, have warped (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section, or show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
  1. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
  2. Warranty shall be in effect during the following period of time from date of Substantial Completion:
     a. Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Flush Wood Doors:
     a. Ampco Products, Inc.
     b. Eggers Industries; Architectural Door Division.
     c. IPIK Door Co., Inc.
     d. Weyerhaeuser Co.

2.2 DOOR CONSTRUCTION, GENERAL
- A. Doors for Painted Finish:
  1. Grade: Custom.
  2. Faces for Interior Doors: match existing door conditions.

2.3 SOLID-CORE DOORS
- A. Interior Veneer-Faced Doors:
  1. Core: Solid Core (SC).
  2. Construction: Five ply, wood stave, then entire unit abrasive planed before veneering.
  3. Finish: Medium Density Overlay (MDO)
  4. Stiles: Hardwood
- B. Fire-Rated Doors: Comply with the following requirements:
  1. Construction: Construction and core specified above for type of face indicated or manufacturer's standard mineral-core construction as required to provide fire rating indicated.
  2. Blocking: For mineral-core doors, provide composite blocking with improved screw-holding capability approved for use in doors of fire ratings indicated and as follows:
     a. 5-inch top-rail blocking.
     b. 5-inch bottom-rail blocking, at doors indicated to have kick, mop, or armor plates.
     c. 4-1/2-by-10-inch lock blocks.
     d. 5-inch midrail blocking, at doors indicated to have exit devices.
  3. Edge Construction: At hinge stiles, provide manufacturer's standard laminated-edge construction with improved screw-holding capability and split resistance and with outer stile matching face veneer.
  4. Pairs: Furnish formed-steel edges and astragals for pairs of fire-rated doors, unless otherwise indicated.

2.4 FABRICATION
- A. Fabricate flush wood doors in sizes indicated for Project site fitting.
- B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.
  1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.
- C. Openings: Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.
  1. Light Openings: Trim openings with moldings of material and profile indicated.

PART 3 - EXECUTION

3.1 EXAMINATION
- A. Examine doors and installed door frames before hanging doors.
  1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
  2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION
- A. Hardware: For installation, see Division 8 Section "Door Hardware."
- B. Manufacturer's Written Instructions: Install doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.
  1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.
- C. Job-Fit Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted with fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining.
  1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold.
  2. Bevel fire-rated doors 1/8 inch in 2 inches (3-1/2 degrees) on lock edge; trim stiles and rails only to extent permitted by labeling agency.
- D. Field-Finished Doors: Refer to the following for finishing requirements:
  1. Division 9 Section "Painting."

3.3 ADJUSTING
- A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION

SECTION 08711 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Related Work Specified Elsewhere:
  1. Section 08110 - Hollow Metal Doors and Frames
  2. Section 08211 - Flush Wood Doors

1.2 SUMMARY
- A. The work in this section shall include furnishing of all items of finish hardware as hereinafter specified or obviously necessary to complete the building, except those items that are specifically excluded from this section of the specification.
  1. Provide labor, materials, and equipment necessary for furnishing the door hardware materials.
- B. The intent of the hardware specification is to specify the hardware for interior and to establish a type, continuity, and standard of quality; however, it shall be the door hardware supplier's responsibility for thoroughly reviewing existing and new conditions, schedules, Specifications, Drawings, and other Contract Documents to verify the suitability of the hardware specified.
  1. Door hardware supplier shall be responsible for furnishing proper hardware for every door opening indicated or scheduled, regardless of whether a hardware set is listed or not.
  2. Items listed with "no substitution permitted" or similar.
- C. At least 10 days before bid due date, door hardware supplier shall notify Architect of omissions, discrepancies, and items he believes to be contrary to applicable codes, laws, statutes, and regulations. Where items of hardware aren't definitely or correctly specified, are required for completion of the Work, a written statement of such omission, error, or other discrepancy to be submitted to Architect, prior to date specified for receipt of bids for clarification by addendum; or, furnish such items in the type and quality established by this specification, and appropriate to the service intended.
- D. No additional monies will be allowed for omissions, changes, or corrections necessary to facilitate proper function and installation of door hardware.

1.3 REFERENCED STANDARDS
- A. The referenced standards listed below are considered part of the requirements listed in this section. If specific aspects of the standards do not apply, the Contractor shall identify the specific references in writing prior to beginning work. All requests for omission must be approved by the Architect.
- B. Builders Hardware Manufacturing Association (BHMA)
- C. NFPA 101 Life Safety Code
- D. NFPA 80 -Fire Doors and Windows
- E. ANSI-A156.xx- Various Performance Standards for Finish Hardware
- F. UL10C – Positive Pressure Fire Test of Door Assemblies
- G. ANSI-A117.1 – Accessible and Usable Buildings and Facilities
- H. DHI /ANSI A115.IG – Installation Guide for Doors and Hardware

1.4 DESCRIPTION OF WORK
- A. Furnish labor and material to complete hardware work indicated, as specified herein, or as may be required by actual conditions at building.
- B. Include all necessary screws, bolts, expansion shields, other devices, if necessary, as required for proper hardware application. The hardware supplier shall assume all responsibility for correct quantities.
- C. Provide a bitting list at Project Close-out.
- D. All hardware shall meet the requirements of Federal, State and Local codes having jurisdiction over this project, notwithstanding any real or apparent conflict therewith in these specifications.
- E. The Owner hereby names the Construction Manager as the authorized party to order keys and bitting lists and to take receipt of these items from the hardware supplier upon completion of the porject.
- F. Fasteners:
  1. Hardware as furnished shall conform to published templates generally prepared for machine screw installation.
  2. Furnish each item complete with all screws required for installation. Typically, all exposed screws installation.
  3. Insofar as practical, furnished concealed type fasteners for hardware units which have exposed screws shall be furnished with Phillips flat heads screws, finished to match adjacent hardware.
  4. Door closers and exit devices to be installed with closed head through bolts (sex bolts).

1.5 SUBMITTALS
- A. Submit in accordance with Division 01 requirements.
- B. Product Data: Manufacturer's specifications and technical data including the following:
  1. Detailed specification of construction and fabrication.
  2. Manufacturer's installation instructions.
  3. Wiring diagrams for each electric product specified. Coordinate voltage with electrical before submitting.
- C. Hardware Schedule: Submit copies of the Hardware Schedule based on door hardware requirements as indicated (including Drawings, schedules, and specifications).
  1. List groups and suffixes in proper sequence.
  2. Completely describe door and list architectural door number.
  3. Manufacturer, product name, and catalog number.
  4. Function, type, and style.
  5. Size and finish of each item.
  6. Mounting heights.
  7. Explanation of abbreviations and symbols used within schedule.
  8. Detailed wiring diagrams, specially developed for each opening, indicating all electric hardware, security equipment and access control equipment, and door and frame rough-ins required for specific opening.
- D. Templates: Submit templates and "reviewed Hardware Schedule" to door and frame supplier and others as applicable to enable proper and accurate sizing and locations of cutouts and reinforcing.
  1. Templates, wiring diagrams and "reviewed Hardware Schedule" of electrical terms to electrical for coordination and verification of voltages and locations.
- E. Keying Schedule: Submit separate detailed schedule indicating clearly how the Owner's and Tenant's final instructions on keying of locks has been fulfilled.
- F. Contract Closeout Submittals: Comply with Division 1 including specific requirements indicated.
  1. Operating and maintenance manuals:
     a. Complete information in care, maintenance, and adjustment, and data on repair and replacement parts, and information on preservation of finishes.
     b. Catalog pages for each product.
  2. Copy of final hardware schedule, edited to reflect, "As installed".
  3. Copy of final keying schedule.
  4. As installed “Wiring Diagrams” for each piece of hardware connected to power, both low voltage and 110 volts.
  5. One set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

1.6 QUALITY ASSURANCE
- A. The finish hardware supplier shall prepare and submit to the architect a complete schedule identifying each door and each set number, following the numbering system and not creating any separate system himself. He shall submit the schedule for review, make corrections as directed and resubmit the corrected schedule for final approval. Approval of schedule will not relieve Contractor of the responsibility for furnishing all necessary hardware, including the responsibility for furnishing correct quantities. This submittal shall include project cut sheets for each product.
- B. No manufacturing orders shall be placed until detailed schedule has been submitted to the architect and written approval received.
- C. After hardware schedule has been approved, furnish templates required by manufacturing contractors for making proper provisions in their work for accurate fitting, finishing hardware setting. Furnish templates in ample time to facilitate progress of work.
- D. Regulatory Label Requirements: Provide testing agency label or stamp on hardware for labeled openings.
  1. Provide UL listed hardware for labeled and 20 minute openings in conformance with requirements for class of opening scheduled.
  2. Underwriters Laboratories requirements have precedence over this specification where conflict exists.
- E. Furnish four (4) sets of operating and maintenance manuals for all hardware.
- F. Hardware supplier shall have an office and warehouse facilities to accommodate the materials used on this project. The supplier must be an authorized distributor of the products specified.
- G. Statement of qualification for distributor and installers.
- H. Statement of compliance with regulatory requirements and single source responsibility.
- I. Distributor's Qualifications: Firm with 3 years experience in the distribution of commercial hardware.
  1. Distributor to employ full time Architectural Hardware Consultants (AHC) for the purpose of scheduling and coordinating hardware and establishing keying schedule.
  2. Hardware Schedule shall be prepared and signed by an AHC.

J. The hardware manufactures of locks, exit devices and closers shall provide a pre-installation class as well as a post-installation walk-thru. This is to ensure proper installation and provide for any adjustments or replacements of hardware as required.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Wrap, protect finishing hardware items for shipment. Deliver to manufacturing contractors hardware items required by them for their application; deliver balance of hardware to job; store in designated location. Each item shall be clearly marked with its intended location.

1.8 PROJECT CONDITIONS

A. Coordinate hardware with other work. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements indicated, as necessary for the proper installation and function, regardless of omissions or conflicts in the information on the Contract Documents.
B. Review Shop Drawings for doors and entrances to confirm that adequate provisions will be made for the proper installation of hardware.

1.9 WARRANTY

A. B.Manufacturer's Warranty:
1. Closers: Ten (10) years
2. Exit Devices: Three (3) Years
3. Locksets & Cylinders: Three (3) years
4. All other Hardware: Two (2) years.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. All numbers and symbols used herein have been taken from the current catalogues of the following manufacturers:

Item:	Manufacturer:	Approved Substitutes:
Hinges	Ives	Hager, McKinney
Elect. Hinge	Ives	McKinney, Hager
Locksets	Schlage	
Electric Strike	Provided and installed by Owner	
Card Reader	Provided and installed by Owner	
Controller	Provided and installed by Owner	
Push Button Release	Provided and installed by Owner	
Closers	LCN	
Push/Pull Plates	Ives	Rockwood, Trimco
Protection Plates	Ives	Rockwood, Trimco
Overhead Stops	Glynn Johnson	Rockwood, ABH
Door Stop	Ives	Rockwood, Trimco
Flush Bolts	Ives	Rockwood, Trimco
Coordinator & Brackets	Ives	Rockwood, Trimco
Threshold & Gasketing	Zero	National Guard, Reese, Pemko

1. To the greatest extent possible, obtain each kind of hardware from one manufacturer only.
2. If material manufactured by other than specified or listed herewith as an equal, is to bid upon, permission must be requested from the architect seven (7) days prior to bidding. If substitution is allowed, it will be noted by addendum.

2.2 MATERIALS:

A. Hinges:
1. Template screw hole locations
2. Bearings are to be fully hardened.
3. Bearing shell is to be consistent shape with barrel.
4. Minimum of 2 permanently lubricated non-detachable bearings on standard weight hinge and 4 permanently lubricated bearing on heavy weight hinges.
5. Equip with easily seated, non-rising pins.

6. Non Removable Pin screws shall be slotted stainless steel screws.
7. Hinges shall be full polished, front, back and barrel.
8. Hinge pin is to be fully plated.
9. Bearing assembly is to be installed after plating.
10. Sufficient size to allow 180-degree swing of door
11. Furnish five knuckles with flush ball bearings
12. Provide hinge type as listed in schedule.
13. Furnish 3 hinges per leaf to 7 foot 6 inch height. Add one for each additional 30 inches in height or fraction thereof.
14. Tested and approved by BHMA for all applicable ANSI Standards for type, size, function and finish
15. UL10C listed for Fire rated doors.

B. Cylindrical Type Locks and Latchsets:
1. Tested and approved by BHMA for ANSI A156.2, Series 4000, Operational Grade 1 & 2 as specified, Heavy Duty, and be UL10C listed.
2. Fit modified ANSI A115.2 door preparation.
3. Locksets to have anti-rotational studs that are thru-bolted
4. Keyed lever shall not have exposed “keeper” hole
5. Each lever to have independent spring mechanism controlling it
6. 2-3/4 inch (70 mm) backset
7. 1/2 inch (13 mm) throw latchbolt
8. Provide sufficient curved strike lip to protect door trim
9. Outside lever sleeve to be seamless, of one-piece construction made of a hardened steel alloy
10. Hub, side plate, shrouded rose, locking pin to be a one-piece casting with a shrouded locking lug.
11. Locksets outside locked lever must withstand minimum 1400 inch pounds of torque. In excess of that, a replaceable part will shear. Key from outside and inside lever will still operate lockset.
12. Functions and design as indicated in the hardware groups.

C. Cylinders:
1. Provide the necessary cylinder housings, collars, rings & springs as recommended by the manufacturer for proper installation.
2. Provide the proper cylinder cams or tail piece as required to operate all locksets and other keyed hardware items listed in the hardware sets.
3. Coordinate and provide as required for related sections.

D. Door Closers:
1. Tested and approved by BHMA for ANSI 156.4, Grade 1
2. UL10C certified
3. Provide 9001-Quality Management and 14001-Environmental Management.
4. Closer shall have extra-duty arms and knuckles
5. Conform to ANSI 117.1
6. Maximum 2 7/16 inch case projection with non-ferrous cover
7. Four Separate adjusting valves for closing and latching speed, backcheck.
8. Provide adapter plates, shim spacers and blade stop spacers as required by frame and door conditions
9. Full rack and pinion type closer
10. Mount closers on non-public side of door, unless otherwise noted in specification
11. Closers shall be non-handed, non-sized and multi-sized.

E. Trim and Plates:
1. Kick plates, mop plates, and armor plates, shall be .050 gauge with 32D finish. Kick plates to be 8” high, mop plates to be 4” high, armor plates to be 36” high. All plates shall be two (2) inches less full width of door and bevel all four (4) edges.
2. Push plates, pull plates, door pulls, and miscellaneous door trim shall be shown in the hardware schedule, 70F 8 x 16, 70Cx110 4 x 16.

F. Door Stops: Provide a dome floor or wall stop for every opening as listed in the hardware sets.
1. Wall stop and floor stop shall be stainless steel.
2. Provide fastener suitable for wall construction.
3. Coordinate reinforcement of walls where wall stop is specified.
4. Provide dome stops where wall stops are not practical. Provide spacers or carpet riser for floor conditions encountered

G. Thresholds:
1. Thresholds shall be as listed in the hardware schedule.

H. Door Silencers:
1. Furnish silencers on all interior frames, 3 for single doors, 2 for pairs. Omit where any type of seals occur.

I. Electric Strikes:

1. To be provided and installed by Owner.

J. Card Readers:
   1. Card readers to be provided and installed by Owner.
   2. Contractor to provide monting box adjacent to door and conduits from box to above ceiling for installation of card readers by Owner.

K. Seals:
   1. All seals shall be finished to match adjacent frame color. Seals shall be furnished as listed in schedule. Material shall be UL listed for labeled openings.

L. Provide one wall mounted Telkee, Lund or MMF series key cabinet complete with hooks, index and tags to accommodate 150% expansion. Coordinate mounting location with architect.

2.3 FINISH:

A. Designations used in Schedule of Finish Hardware - 3.6,E, and elsewhere to indicate hardware finishes are those listed in ANSI/BHMA A156.18 including coordination with traditional U.S. finishes shown by certain manufacturers for their products

B. Powder coat door closers to match other hardware, unless otherwise noted.

C. Aluminum items shall be finished to match predominant adjacent material. Seals to coordinate with frame color.

2.4 KEYS AND KEYING:

A. A.Provide keyed brass keys during the construction period. Permanent and keys (prepared according to the accepted keying schedule) will be furnished to the Owner.

B. All locks and cylinders shall be Schlage 6-pin Keyway master keyed into HCSO system. This supplier shall meet with tenant and building manager to determine exact keying requirements.

C. Furnish Keys in the following quantities:
   1. 1 each Grand Masterkeys
   2. 4 each Masterkeys
   3. 3 each Change keys each

D. Stamp all keys “DO NOT DUPLICATE”.

E. Keying Schedule: Arrange for a keying meeting, and programming meeting with Architect Owner and hardware supplier, and other involved parties to ensure locksets and locking hardware, are functionally correct and keying and programming complies with project requirements. Furnish 3 typed copies of keying and programming schedule to Architect.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Verification of conditions: Examine doors, frames, related items and conditions under which Work is to be performed and identify conditions detrimental to proper and or timely completion.
   1. Do not proceed until unsatisfactory conditions have been corrected.

3.2 HARDWARE LOCATIONS:

A. A.Mount hardware units at heights indicated in the following publications except as specifically indicated or required to comply with the governing regulations.
   1. Recommended Locations for Builder’s Hardware for Standard Steel Doors and Frames, by the Door and Hardware Institute (DHI).
   2. Recommended locations for Architectural Hardware for flush wood doors (DHI).
   3. WDMA Industry Standard I.S.-1A-04, Industry Standard for Architectural wood flush doors.

3.3 INSTALLATION:

A. Install each hardware item per manufacturer's instructions and recommendations. Do not install surface mounted items until finishes have been completed on the substrate. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

B. Conform to local governing agency security ordinance.

C. Install Conforming to ICC/ANSI A117.1 Accessible and Usable Building and Facilities.
   1. Adjust door closer sweep periods so that from the open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the landing side of the door.

D. Installed hardware using the manufacturers fasteners provided. Drill and tap all screw holes located in metallic materials. Do not use “Riv-Nuts” or similar products.

E. Clean adjacent surfaces soiled by hardware installation.

F. Coordinate installation of hardware for wood doors with Section 09912 - Painting.
   1. Do not install surface mounted items until the final coat of clear finish has been applied and dried.

2. 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.

3.4 FIELD QUALITY CONTROL AND FINAL ADJUSTMENT:

A. Contractor/Installers, Field Services: After installation is complete, contractor shall inspect the completed door openings on site to verify installation of hardware is complete and properly adjusted, in accordance with both the Contract Documents and final shop drawing.
   1. Check and adjust closers to ensure proper operation.
   2. Check latchset, lockset, and exit devices are properly installed and adjusted to ensure proper operation.
      a. Verify levers are free from binding.
      b. Ensure latchbolts and dead bolts are engaged into strike and hardware is functioning.
   3. Report findings, in writing, to architect indicating that all hardware is installed and functioning properly. Include recommendations outlining corrective actions for improperly functioning hardware if required.

3.5 PROTECTION:

A. Contractor shall protect all hardware as it is stored on construction site in a covered and dry place.
B. Contractor shall protect exposed hardware installed on doors during the construction phase.
C. Contractor shall protect all hardware to be reused.

3.6 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.
B. Check quantities and advise the architect if omissions or discrepancies occur.
C. All lock functions; applications and keying shall be reviewed with the Architect and Owner at a meeting before finish hardware schedules are submitted for final approval. Supplier to confirm that cylinder type specified is appropriate to function properly in the lock, deadbolt, exit devices and mullions supplied for this project.
D. Manufacturer List:

Code	Name
SCH	Schlage
IVE	Ives
LCN	LCN
GLY	Glynn Johnson
ZE	Zero

E. Finsh List:

Code	Description
652	Satin Chromium Plated
626	Satin Chromium Plated
630	Satin Stainless Steel
689	Aluminum Painted
US26D	Chromium Plated, Dull

F. Option List:

Code	Description
B4E	BEVELED 4 EDGES - KICK PLATES
NRP	Non-removable pin

G. Hardware Sets:

Hardware Group No. 01

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	MORTISE CYLINDER	20-001 118	626	SCH
			BALANCE OF HARDWARE EXISTING		

EXISTING ALUMINUM STOREFRONT.

Hardware Group No. 02

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	MORTISE CYLINDER	20-001 118	626	SCH
			BALANCE OF HARDWARE EXISTING		

EXISTING ALUMINUM STOREFRONT.

Hardware Group No. 03

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	630	IVE
1	EA	STOREROOM LOCK	ND80PD SPA	626	SCH
1	EA	LOCK GUARD	LG10	630	IVE
1	EA	SURFACE CLOSER	4050 SCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	RAIN DRIP	142A	AL	ZER
1	EA	GASKETING	188S-BK	S-Bk	ZER
1	EA	THRESHOLD	65A-MSLA-10	A	ZER
1	EA	FILLER PLATES	AS REQUIRED		

Hardware Group No. 04

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	ENTRANCE LOCK	AL53PD NEP	626	SCH
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	COAT AND HAT HOOK	572	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 05

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	ENTRANCE LOCK	AL53PD NEP	626	SCH
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	COAT AND HAT HOOK	572	626	IVE
3	EA	SILENCER	SR64	GRY	IVE
1	EA	FILLER PLATES	AS REQUIRED		

Hardware Group No. 06

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	STOREROOM LOCK	AL80PD NEP	626	SCH
1	EA	SURFACE CLOSER	4050 RW/PA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 07

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	CLASSROOM LOCK	AL70PD NEP	626	SCH
1	EA	SURFACE CLOSER	4050 RW/PA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 08

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	CLASSROOM LOCK	AL70PD NEP	626	SCH
1	EA	SURFACE CLOSER	4050 RW/PA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1	EA	FILLER PLATES	AS REQUIRED		

Hardware Group No. 09

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	CLASSROOM LOCK	AL70PD NEP	626	SCH
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 10

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	CLASSROOM LOCK	AL70PD NEP	626	SCH
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1	EA	FILLER PLATES	AS REQUIRED		

Hardware Group No. 11

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	PRIVACY LOCK	AL40S NEP	626	SCH
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 12

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	PRIVACY LOCK	AL40S NEP	626	SCH
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1	EA	FILLER PLATES	AS REQUIRED		

Hardware Group No. 13

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	PUSH PLATE	8200 4" X 16"	630	IVE
1	EA	PULL PLATE	8302 10" 4" X 16"	630	IVE
1	EA	SURFACE CLOSER	4050 EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1	EA	FILLER PLATES	AS REQUIRED		

Hardware Group No. 14

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	STOREROOM LOCK	AL80PD NEP	626	SCH
1	EA	SURFACE CLOSER	4050 RW/PA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B4E	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE
1	EA	ELECTRIC STRIKE	SPECIFIED ELSEWHERE		
1	EA	REQUEST TO EXIT	SPECIFIED ELSEWHERE		
1	EA	PROX READER	SPECIFIED ELSEWHERE		
1	EA	DOOR POSITION SWITCH	SPECIFIED ELSEWHERE		

ACCESS CONTROL BY OWNER.

Hardware Group No. 15

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
5	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ELECTRIC HINGE	5BB1 4.5 X 4.5 TW8	652	IVE
1	SET	CONST LATCHING BOLT	FB51P	630	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	AL80PD NEP	626	SCH
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	SURFACE CLOSER	4050 RW/PA	689	LCN
2	EA	SILENCER	SR64	GRY	IVE
1	EA	ELECTRIC STRIKE	SPECIFIED ELSEWHERE		
1	EA	REQUEST TO EXIT	SPECIFIED ELSEWHERE		
1	EA	PROX READER	SPECIFIED ELSEWHERE		
1	EA	DOOR POSITION SWITCH	SPECIFIED ELSEWHERE		

ACCESS CONTROL BY OWNER.

Hardware Group No. 16

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
6	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
2	EA	MANUAL FLUSH BOLT	FB457	626	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	STOREROOM LOCK	AL80PD NEP	626	SCH
2	EA	OH STOP	450S	630	GLY
2	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 17

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	STOREROOM LOCK	AL80PD NEP	626	SCH
1	EA	WALL STOP	WS406/407CCV	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

Hardware Group No. 18

Provide each PR door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
6	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
2	EA	MANUAL FLUSH BOLT	FB457	626	IVE
1	EA	DUST PROOF STRIKE	DP2	626	IVE
1	EA	CLASSROOM LOCK	AL70PD NEP	626	SCH
2	EA	OH STOP	450S	630	GLY
2	EA	SILENCER	SR64	GRY	IVE
1	EA	FILLER PLATES	AS REQUIRED		

Hardware Group No. 19

Provide each SGL door(s) with the following:

DOOR FIXED. NO HDW REQUIRED

END OF SECTION

SECTION 08800 - GLAZING

PART 1 - GENERAL

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

1.2 SUMMARY
- A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
  1. Doors.
- B. Related Sections include the following:
  1. Division 7 Section "Joint Sealants".

1.3 DEFINITIONS
- A. Manufacturers of Glass Products: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

1.4 PERFORMANCE REQUIREMENTS

1.5 SUBMITTALS
- A. Product Data: For each glass product and glazing material indicated.
- B. Samples: for each glass specified 12-inch- (300-mm-) square Samples for glass.
- C. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.
- D. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.
- E. Qualification Data: For installers.
- F. Preconstruction Adhesion and Compatibility Test Report: From glazing sealant manufacturer indicating glazing sealants were tested for adhesion to glass and glazing channel substrates and for compatibility with glass and other glazing materials.

1.6 QUALITY ASSURANCE
- A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association Glazier Certification Program as Level 2 (Senior Glaziers) or Level 3 (Master Glaziers).
- B. Source Limitations for Glass: Obtain the following through one source from a single manufacturer for each glass type: clear float glass and wire glass.
- C. Source Limitations for Glazing Accessories: Obtain glazing accessories through one source from a single manufacturer for each product and installation method indicated.
- D. Glass Product Testing: Obtain glass test results for product test reports in "Submittals" Article from a qualified testing agency based on testing glass products.
  1. Glass Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
- E. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201 and, for wired glass, ANSI Z97.1.
  1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council or another certification agency or manufacturer acceptable to authorities having jurisdiction.
  2. Where glazing units, including Kind FT glass and laminated glass, are specified in Part 2 articles for glazing lites more than 9 sq. ft. (0.84 sq. m) in area, provide glazing products that comply with Category II materials, and for lites 9 sq. ft. (0.84 sq. m) or less in area, provide glazing products that comply with Category I or II materials.
- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.7 DELIVERY, STORAGE, AND HANDLING
A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.8 PROJECT CONDITIONS
A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F (4.4 deg C).

1.9 WARRANTY
A. Manufacturer's Special Warranty for Glass Products: Manufacturer's standard form, made out to Owner and signed by manufacturer agreeing to replace glass units that deteriorate, including seal failure, interpane dusting or misting, delamination of laminated glass and replacement of same.
1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS
A. Monolithic Glass, Safety Glazing [G1]: ASTM C 1036, Category II Tempered, clear, 1/4".
1. Locate as shown on drawings.
B. Laminated Glass, Level 2 Resistance [G2].
1. Locate as shown on drawings.
2. ASTM C 1172, 1 1/4" Nominal thickness.

2.2 GLAZING COMPOUNDS
A. General: Provide products of type indicated, complying with the following requirements:
1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
B. Elastomeric Glazing Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

2.3 MISCELLANEOUS GLAZING MATERIALS
A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.4 FABRICATION OF GLAZING UNITS
A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

PART 3 - EXECUTION

3.1 EXAMINATION
A. Examine framing glazing, with Installer present, for compliance with the following:
1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
F. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm) as follows:
    1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
    2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

3.4 CLEANING AND PROTECTION

A. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.
B. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION

SECTION 09260 - GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.1 SECTION INCLUDES
- A. Performance criteria for gypsum board assemblies.
- B. Metal stud wall framing.
- C. Metal channel ceiling framing.
- D. Gypsum sheathing.
- E. Gypsum wallboard.
- F. Joint treatment and accessories.

1.2 RELATED REQUIREMENTS
- A. Section 01616 - Volatile Organic Compound (VOC) Content Restrictions.
- B. Section 06100 - Rough Carpentry: Wood blocking product and execution requirements.
- C. Section 07 2100 - Thermal Insulation: Acoustic insulation.
- D. Section 07900 - Joint Sealers.
- E. Section 09912 - Painting

1.3 REFERENCE STANDARDS
- A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- B. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
- C. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members.
- D. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
- E. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board.
- F. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
- G. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
- H. ASTM C1396/C1396M - Standard Specification for Gypsum Board.
- I. ASTM C1629/C1629M - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels.
- J. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
- K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- L. GA-216 - Application and Finishing of Gypsum Board; Gypsum Association.
- M. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc..

1.4 SUBMITTALS
- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.
- C. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.
- D. Test Reports: For stud framing products that do not comply with ASTM C645 or ASTM C754, provide independent laboratory reports showing maximum stud heights at required spacings and deflections.

1.5 QUALITY ASSURANCE
- A. Installer Qualifications: Company specializing in performing gypsum board application and finishing.
- B.

PART 2 PRODUCTS

2.1 GYPSUM BOARD ASSEMBLIES
- A. Provide completed assemblies complying with ASTM C840 and GA-216.
- B. Fire Rated Assemblies: Provide completed assemblies with the following characteristics:
  1. Fire Rated Partitions: UL listed assembly No. 419; 1 hour rating.
  2. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL (FRD).

2.2 METAL FRAMING MATERIALS
- A. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf.
  1. Exception: The minimum metal thickness and section properties requirements of ASTM C645 are waived provided steel of 40 ksi minimum yield strength is used, the metal is continuously dimpled, the effective thickness is at least twice teh base metal thickness and maximum stud heights are determined by testing in accordance with ASTM E 72 using assemblies specified by ASTM C 754.
  2. Studs: "C" shaped with flat or formed webs with knurled faces.
  3. Runners: U shaped, sized to match studs.
     a. Ceiling Channels: C-shaped.
  4. Furring: Hat-shaped sections, minimum depth of 7/8 inch.
- B. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.
- C. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection using slotted holes, screws and anti-friction bushings, preventing rotation of studs while maintaining structural performance of partition.
  1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI SG02-1.
  2. Material: ASTM A653/A653M steel sheet, SS Grade 50/340, with G60/Z180 hot dipped galvanized coating.

2.3 BOARD MATERIALS
- A. Manufacturers - Gypsum-Based Board:
- B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
  1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
  2. Thickness:
     a. Vertical Surfaces: 5/8 inch.
     b. Ceilings: 1/2 inch.
- C. Ceiling Board: Special sag resistant gypsum ceiling board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
  1. Application: Ceilings, unless otherwise indicated.
  2. Thickness: 1/2 inch.
  3. Edges: Tapered.

2.4 ACCESSORIES
- A. Joint Materials: ASTM C475 and as recommended by gypsum board manufacturer for project conditions.
- B. High Build Drywall Surfacer: Vinyl acrylic latex-based coating for spray application, designed to take the place of skim coating and separate paint primer in achieving Level 5 finish.
- C. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inch in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion resistant.
- D. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion resistant.
- E. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

PART 3 EXECUTION

3.1 EXAMINATION
- A. Verify that project conditions are appropriate for work of this section to commence.

3.2 FRAMING INSTALLATION
- A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.
- B. Suspended Ceilings and Soffits: Space framing and furring members at 16 inches on center.
- C. Studs: Space studs at 16 inches on center.
  1. Extend partition framing to structure where indicated and to ceiling in other locations.
  2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
  3. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.
- D. Blocking: Install wood blocking for support of:

1. Wall mounted cabinets.
2. Audio / Visual mounting hardware.

3.3 BOARD INSTALLATION

A. Comply with ASTM C 840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
B. Fire-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

3.4 INSTALLATION OF TRIM AND ACCESSORIES

A. Corner Beads: Install at external corners, using longest practical lengths.
B. Edge Trim: Install at locations where gypsum board abuts dissimilar materials .

3.5 JOINT TREATMENT

A. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish and other areas specifically indicated.
   2. Level 1: Fire rated wall areas above finished ceilings, whether or not accessible in the completed construction.
   3. Level 0: Temporary partitions.
B. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch.
C. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

3.6 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

SECTION 09310 - CERAMIC TILE

PART 1 - GENERAL

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

1.2 SUMMARY
- A. This Section includes the following:
  1. Ceramic floor tile.
  2. Glazed wall tile.
- B. Related Sections include the following:
  1. Division 7 Section "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.

1.3 DEFINITIONS
- A. Module Size: Actual tile size (minor facial dimension as measured per ASTM C 499) plus joint width indicated.

1.4 PERFORMANCE REQUIREMENTS
- A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:
  1. Level Surfaces: Minimum 0.6.

1.5 SUBMITTALS
- A. Product Data: For each type of tile, mortar, grout, and other products specified.
- B. Shop Drawings: For the following:
  1. Tile patterns and locations.
  2. Widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.
- C. Tile Samples for Initial Selection: Submit tile sample matching color, texture, and dimension of existing tile.
- D. Stone Samples: Samples of actual sections of stone showing the full range of colors, and patterns available for each type stone.
- E. Grout Samples for Initial Selection: Submit grout sample matching color of existing grout.
- F. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.

1.6 QUALITY ASSURANCE
- A. Source Limitations for Tile: Obtain each color, grade, finish, type, composition, and variety of tile from one source with resources to provide products from the same production run for each contiguous area of consistent quality in appearance and physical properties without delaying the Work.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from one source and by a single manufacturer for each product:
- D. Mockups: Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.
  1. Build mockup of floor tile installation.
  2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- E. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings."

1.7 DELIVERY, STORAGE, AND HANDLING
- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement in ANSI A137.1 for labeling sealed tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

1.8 PROJECT CONDITIONS
A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL
A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.
1. Provide tile complying with Standard Grade requirements, unless otherwise indicated.
B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI standards referenced in "Setting Materials" and "Grouting Materials" articles.
C. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:
1. Provide Architect's selections from manufacturer's full range of colors, textures, and patterns for products of type indicated.
2. Provide tile trim and accessories that match color and finish of adjoining flat tile.
D. Factory Blending: For tile exhibiting color variations within the ranges selected during Sample submittals, blend tile in the factory and package so tile units taken from one package show the same range in colors as those taken from other packages and match approved Samples.
E. Mounting: Where factory-mounted tile is required, provide back- or edge-mounted tile assemblies as standard with manufacturer, unless another mounting method is indicated.

2.2 TILE PRODUCTS
A. Unglazed Ceramic Tile: Provide factory-mounted flat tile complying with the following requirements:
1. Composition: Porcelain.
2. Module Size: 12 by 12 inches.
3. Nominal Thickness: 1/4 inch.
4. Face: Plain with cushion edges.
B. Glazed Wall Tile: Provide flat tile complying with the following requirements:
1. Module Size: 4-1/4 by 4-1/4 inches.
2. Thickness: 5/16 inch.
3. Face: Plain with cushion edges.
4. Finish: Bright, opaque glaze.
5. Mounting: Factory back-mounted.
C. Glazed Wall Tile Trim Units: Matching characteristics of adjoining flat tile and coordinated with sizes and coursing of adjoining flat tile where applicable. Provide shapes as follows, selected from manufacturer's standard shapes:
1. Base for Thin-Set Mortar Installations: Straight, module size 4-1/4 by 4-1/4.
2. Wainscot Cap for Thin-Set Mortar Installations: Surface bullnose, module size 4-1/4 by 4-1/4 inches.
3. External Corners for Thin-Set Mortar Installations: Surface bullnose, module size 4-1/4 by 4-1/4 inches.
4. Internal Corners: Field-butted square corners except with coved base and cap angle pieces designed to fit with stretcher shapes.

2.3 SETTING AND GROUTING MATERIALS
A. Latex-Portland Cement Mortar: ANSI A118.4, composed as follows:
1. Prepackaged Dry-Mortar Mix: Factory-prepared mixture of portland cement; dry, redispersible, ethylene vinyl acetate additive; and other ingredients to which only water needs to be added at Project site.
B. Polymer-Modified Tile Grout: ANSI A118.7, color as indicated.
1. Polymer Type: Acrylic resin or styrene-butadiene rubber in liquid-latex form for addition to prepackaged dry-grout mix.
a. Unsanded grout mixture.

2.4 ELASTOMERIC SEALANTS
A. General: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements in Division 7 Section "Joint Sealants."
B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints, unless otherwise indicated.

2.5 MISCELLANEOUS MATERIALS
A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
B. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

2.6 MIXING MORTARS AND GROUT
A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
B. Add materials, water, and additives in accurate proportions.
C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION
A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
1. Verify that substrates for setting tile are firm; dry; clean; free of oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 Series of tile installation standards for installations indicated.
2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.
3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION
A. Remove coatings, including curing compounds and other substances that contain soap, wax, oil, or silicone, that are incompatible with tile-setting materials.
B. Provide concrete substrates for tile floors installed with thin-set mortar that comply with flatness tolerances specified in referenced ANSI A108 Series of tile installation standards.
1. Fill cracks, holes, and depressions with trowelable leveling and patching compound according to tile-setting material manufacturer's written instructions. Use product specifically recommended by tile-setting material manufacturer.
2. Remove protrusions, bumps, and ridges by sanding or grinding.
3. Remove all existing flooring in locations identified for renovation where new floor tile is scheduled for installation.
C. Blending: For tile exhibiting color variations within ranges selected during Sample submittals, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 INSTALLATION, GENERAL
A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 Series "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.
B. TCA Installation Guidelines: TCA's "Handbook for Ceramic Tile Installation." Comply with TCA installation methods indicated in ceramic tile installation schedules.
C. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
E. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints with joints in existing adjacent floor tile.
1. For tile mounted in sheets, make joints between tile sheets the same width as joints within tile sheets so joints between sheets are not apparent in finished work.
F. Lay out tile wainscots to next full tile beyond dimensions indicated.

G. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
   1. Locate joints in tile surfaces directly above joints in concrete substrates.
   2. Prepare joints and apply sealants to comply with requirements of Division 7 Section "Joint Sealants."
H. Grout tile to comply with the requirements of the following tile installation standards:
   1. For ceramic tile grouts (sand-portland cement, dry-set, commercial portland cement, and latex-portland cement grouts), comply with ANSI A108.10.

3.4 FLOOR TILE INSTALLATION
A. General: Install tile to comply with requirements in the Floor Tile Installation Schedule, including those referencing TCA installation methods and ANSI A108 Series of tile installation standards.
B. Joint Widths: Install tile on floors with the following joint widths: match existing joint widths and align joints with existing joints.
   1. Ceramic Mosaic Tile: 1/16 inch.
   2. Ceramic Tile: 1/16 inch.
C. Stone Thresholds: Install stone thresholds at locations indicated; set in same type of setting bed as abutting field tile, unless otherwise indicated.
   1. Set thresholds in latex-portland cement mortar for locations where mortar bed would otherwise be exposed above adjacent nontile floor finish.

3.5 WALL TILE INSTALLATION
A. Install types of tile designated for wall installations to comply with requirements in the Wall Tile Installation Schedule, including those referencing TCA installation methods and ANSI setting-bed standards.
B. Joint Widths: Install tile on walls with the following joint widths:
   1. Wall Tile: 1/16 inch.
C. Feature Strip: Provide tile pattern at wall tile (1 field color, 1 accent color) as indicated in the Drawings.

3.6 CLEANING AND PROTECTING
A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
   1. Remove latex-portland cement grout residue from tile as soon as possible.
   2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions, but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
   3. Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer's written instructions, but no sooner than 10 days after installation. Protect metal surfaces, cast iron, and vitreous plumbing fixtures from effects of acid cleaning. Flush surface with clean water before and after cleaning.
B. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.
C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure tile is without damage or deterioration at the time of Substantial Completion.
   1. When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.
   2. Prohibit foot and wheel traffic from tiled floors for at least 1 day after grouting is completed.
D. Before final inspection, remove protective coverings and rinse neutral cleaner from tile surfaces.

3.7 FLOOR TILE INSTALLATION SCHEDULE
A. Ceramic Tile Floor Installation: For interior floor installations, comply with the following:
   1. Installation Method: TCA F113 (thin-set mortar bonded to concrete subfloor).
   2. Setting Bed and Grout: ANSI A108.5 with the following mortar and grout:
      a. Latex-portland cement mortar.
      b. Unsanded latex-portland cement grout.

3.8 WALL TILE INSTALLATION SCHEDULE
A. Ceramic Tile Wall Installations: Where interior wall installations of this designation are indicated, comply with the following:
   1. Tile Type: Glazed wall tile
   2. Installation Method: TCA W243 (thin-set mortar bonded to gypsum board on metal studs).

3. Setting Bed and Grout: ANSI A108.5 with the following mortar and grout
   a. Latex-portland cement mortar.
   b. Unsanded latex-portland cement grout.

END OF SECTION

SECTION 09511 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

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

1.2 SUMMARY
- A. This Section includes acoustical panels and exposed suspension systems for ceilings.

1.3 SUBMITTALS
- A. Product Data: For each type of product indicated.

1.4 QUALITY ASSURANCE
- A. Source Limitations:
  1. Acoustical Ceiling Panel: Obtain each type through one source from a single manufacturer.
  2. Suspension System: Obtain each type through one source from a single manufacturer.
- B. Mockups: Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.
  1. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING
- A. Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.6 PROJECT CONDITIONS
- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.7 COORDINATION
- A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.8 WARRANTY
- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Manufacturers Warranty: Written warranty, signed by ceiling and grid manufacturer agreeing to replace ceiling panels that sag or grid that rusts within specified warranty period.
  1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
- A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:
  1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 ACOUSTICAL PANELS, GENERAL
- A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.
- B. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.

2.3 MINERAL-BASE ACOUSTICAL PANELS (APC)
- A. Products:
  1. Armstrong, Cortega Fire Guard.
- B. Color: White.
- C. Edge Detail: Tegular.
- D. Thickness: 5/8 inch.
- E. Size: 24 by 24 inches. Use 24 x 48 tile to accommodate rooms that require a strip 6” or less.

2.4 METAL SUSPENSION SYSTEMS, GENERAL
- A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.
- B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.
  1. High-Humidity Finish: Comply with ASTM C 635 requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.
- C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated.
  1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing per ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
     a. Type: Postinstalled expansion anchors.
     b. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition.
  2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E 1190, conducted by a qualified testing and inspecting agency.
- D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
  1. Zinc-Coated Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
  2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.135-inch diameter wire.

2.5 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILINGS
- A. Products:
  1. Reuse existing grid.
  2. Where replacement in areas is required - match existing.
  3. Chicago Metallic: 211-01H, 1210-01H, 1226-01H, or 1420-01
- B. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, prepainted, hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 (Z90) coating designation, with prefinished 15/16-inch wide metal caps on flanges.
  1. Structural Classification: Intermediate-duty system.
  2. End Condition of Cross Runners: Butt-edge type.
  3. Face Design: Flat, flush.
  4. Cap Material: Steel cold-rolled sheet.
  5. Cap Finish: Painted white.

2.6 METAL EDGE MOLDINGS AND TRIM
- A. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated (Shadowline as manufactured by USG Interiors or equal) or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with the following requirements:
  1. Aluminum Alloy: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of aluminum extrusions complying with ASTM B 221 (ASTM B 221M) for alloy and temper 6063-T5.
  2. Finish designations prefixed by AA comply with system established by the Aluminum Association for designating aluminum finishes.
  3. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below).

Apply baked enamel complying with paint manufacturer's written instructions for cleaning, conversion coating, and painting.

a. Organic Coating: Thermosetting, primer/topcoat system with a minimum dry film thickness of 0.8 to 1.2 mils (0.02 to 0.03 mm).
b. Color: White.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.
B. Remove all acoustic ceiling panels and repaint grid

3.3 INSTALLATION, GENERAL

A. General: Install acoustical panel ceilings to comply with ASTM C 636 and seismic requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
B. Suspend ceiling hangers from building's 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 structure or of ceiling suspension system.
   2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
   3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
   4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
   5. Do not attach hangers to steel roof deck. Attach hangers to structural members.
   6. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
   1. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
   2. Do not use exposed fasteners, including pop rivets, on moldings and trim.
D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
E. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
   1. Arrange directionally patterned acoustical panels as follows:
      a. Install panels with pattern running in one direction parallel to short axis of space.
   2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.

3.4 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 09651 - RESILIENT FLOOR TILE, BASE AND ACCESSORIES

PART 1 - GENERAL

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

1.2 SUMMARY
- A. This Section includes the following:
  1. Vinyl composition tile (VCT).
  2. Resilient wall base and accessories.

1.3 SUBMITTALS
- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of product indicated.
- C. Samples for Verification: Full-size units of each color and pattern of resilient floor tile required.
  1. Resilient Wall Base and Accessories: Manufacturer's standard-size Samples, but not less than 12 inches long, of each resilient product color and pattern required.
- D. Product Certificates: Signed by manufacturers of resilient products certifying that each product furnished complies with requirements.
- E. Maintenance Data: For resilient products to include in maintenance manuals.

1.4 QUALITY ASSURANCE
- A. Installer Qualifications: Engage an experienced installer to perform work of this Section who has specialized in installing resilient products similar to those required for this Project and with a record of successful in-service performance.
- B. Source Limitations: Obtain each type, color, and pattern of product specified from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.
- C. Fire-Test-Response Characteristics: Provide products identical to those tested for fire-exposure behavior per test method indicated by a testing and inspecting agency acceptable to authorities having jurisdiction.
  1. Critical Radiant Flux: 0.45 W/sq. cm or greater when tested per ASTM E 648.
  2. Smoke Density: Maximum specific optical density of 450 or less when tested per ASTM E 662.

1.5 DELIVERY, STORAGE, AND HANDLING
- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store tiles on flat surfaces.

1.6 PROJECT CONDITIONS
- A. Maintain temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following time periods:
  1. 48 hours before installation.
  2. During installation.
  3. 48 hours after installation.
- B. After post-installation period, maintain temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 COLORS AND PATTERNS
- A. Colors and Patterns: Match existing Building colors.

2.2 VINYL COMPOSITION TILE
- A. Vinyl Composition Tile:
  1. Basis of Design: Armstrong World Industries, Inc. Standard Excelon, Imperial Texture.
  2. Color and Pattern: As selected by Architect from manufacturer's full range of colors for pattern indicated in the Basis of Design.
- B. Class: 2 (through-pattern tile).
- C. Wearing Surface: Smooth.
- D. Thickness: 0.125 inch
- E. Size: 12 by 12 inches.

2.3 RESILIENT WALL BASE
- A. Type (Material Requirement): TV (vinyl).
- B. Group (Manufacturing Method): I (solid, homogeneous).
- C. Style: Cove (with top-set toe).
- D. Color: Match building standard.
- E. Minimum Thickness: 0.125 inch
- F. Height: 4 inches.
- G. Lengths: Coils in manufacturer's standard length.
- H. Outside Corners: Job Formed.
- I. Inside Corners: Job Formed.
- J. Surface: Smooth.

2.4 INSTALLATION MATERIALS
- A. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
- B. Provide compunds and adhesives with limited VOCs. Refer to Section 01616-VOC Content Restrictions.

PART 3 - EXECUTION

3.1 EXAMINATION
- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance.
  1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
  2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION
- A. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
- B. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
  1. Do not install resilient products until they are same temperature as space where they are to be installed.

3.3 RESILIENT WALL BASE INSTALLATION
- A. Apply wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
  1. At the Architect's discretion, provide a different color base (from manufacturer's full range of colors) for the toe spaces of casework and cabinets than that of the room.
- B. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.
- C. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- D. Do not stretch wall base during installation.
- E. On masonry surfaces or other similar irregular substrates, fill voids along top edge of wall base with manufacturer's recommended adhesive filler material.
- F. Job-Formed Corners:
  1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends. Shave back of base at points where bends occur and remove strips perpendicular to length of base that are only deep enough to produce a snug fit without removing more than half the wall base thickness.
  2. Inside Corners: Use straight pieces of maximum lengths possible. Form by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce a snug fit to substrate.

3.4 RESILIENT ACCESSORY INSTALLATION
- A. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor coverings that would otherwise be exposed.

3.5 CLEANING AND PROTECTION
- A. Perform the following operations immediately after completing resilient product installation:
  1. Remove adhesive and other blemishes from exposed surfaces.

B. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.

END OF SECTION

SECTION 09685 - CARPET TILE

PART 1 GENERAL

1.1 SECTION INCLUDES
- A. Carpet tile, fully adhered.

1.2 RELATED REQUIREMENTS
- A. Section 01616 - Volatile Organic Compound (VOC) Content Restrictions.

1.3 REFERENCE STANDARDS
- A. CRI (CIS) - Carpet Installation Standard; Carpet and Rug Institute.
- B. CRI (GLA) - Green Label Testing Program - Approved Adhesive Products; Carpet and Rug Institute.
- C. CRI (GLP) - Green Label Plus Testing Program - Certified Products; Carpet and Rug Institute.

1.4 SUBMITTALS
- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
- C. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.
- D. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.
- E. Maintenance Materials: Furnish the following for Hillsborough County Sheriff's Office's use in maintenance of project.
  1. See Section 01600 - Product Requirements, for additional provisions.
  2. Extra Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.

1.5 QUALITY ASSURANCE
- A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.

1.6 FIELD CONDITIONS
- A. Store materials in area of installation for minimum period of 48 hours prior to installation.
  1. 60 degrees F to 80 degrees F.
  2. Relative Humidity: below 65%.
- B. Do not stack pallets from manufacturer.

1.7 EXTRA MATERIALS
- A. See Section 01 6000 - Product Requirements, for additional provisions.
- B. Provide 5% additional of carpet tiles of each color and pattern selected.

PART 2 PRODUCTS

2.1 MANUFACTURERS
- A. Shaw Industries .
- B. Substitutions: See Section 01600 - Product Requirements.

2.2 MATERIALS
- A. Tile Carpeting: Tufted, textured loop, manufactured in one color dye lot.
  1. Product: Cento / Singular manufactured by Milliken & Company.
  2. Tile Size: 39.4 x 39.4 inch, nominal.
  3. Thickness: 0.31 inch.
  4. Color: to be selected from Manufacturers full color range.
  5. Pattern: to be selected from Manufacturers full pattern range.
  6. VOC Content: Provide CRI Green Label Plus certified product; in lieu of labeling, independent test report showing compliance is acceptable.
  7. Product Recycled Content: 44.4%
  8. Total Post Consumer Content: Min 11%
  9. Gage: 1/10 inch.
  10. Stitches: 14.4 per inch.
  11. Density Factor: 8727.
  12. Light Fastness: >= 4.0 @ 80 Hours.

13. Primary Backing Material: Synthetic .

2.3 ACCESSORIES
A. Edge Strips: Embossed aluminum, _____ color.
1. Provide transition strips from carpet to adjacent floor finishes.
a. Armstrong VT0 transition.
B. Adhesives: Acceptable to carpet tile manufacturer, compatible with materials being adhered; maximum VOC of 50 g/L; CRI Green Label certified; in lieu of labeled product, independent test report showing compliance is acceptable.
1. RS; low VOC, factory applied "dry" adhesive applied to backing and cured during manufacturing.

PART 3 EXECUTION

3.1 EXAMINATION
A. Verify that sub-floor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.
B. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to sub-floor surfaces.
C. Verify that concrete sub-floor surfaces are ready for carpet tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by carpet tile manufacturer and adhesive materials manufacturer.

3.2 PREPARATION
A. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler.
B. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.
C. Vacuum clean substrate.

3.3 INSTALLATION
A. Starting installation constitutes acceptance of sub-floor conditions.
B. Install carpet tile in accordance with manufacturer's instructions and CRI (CIS).
C. Blend carpet from different cartons to ensure minimal variation in color match.
D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.
E. Lay carpet tile in square pattern, with pile direction alternating to next unit (quarter turn), set parallel to building lines.
F. Locate change of color or pattern between rooms under door centerline.
G. Fully adhere carpet tile to substrate.
H. Trim carpet tile neatly at walls and around interruptions.
I. Complete installation of edge strips, concealing exposed edges.
J. Maintain 65 degrees F ambient temperature and 65% Relative Humidity for 72 hours prior to, during, and 48 hours after installation.

3.4 CLEANING
A. Remove excess adhesive without damage, from floor, base, and wall surfaces.
B. Clean and vacuum carpet surfaces.

END OF SECTION

SECTION 09912 - PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes surface preparation and field painting of exposed exterior and interior items and surfaces.
   1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

B. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color or finish is not indicated, Architect will select from standard colors and finishes available.

C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.
   1. Prefinished items include the following factory-finished components:
      a. Architectural woodwork.
      b. Acoustical Wall Panels.
      c. Finished mechanical and electrical equipment.
      d. Light fixtures.
   2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
      a. Furred areas.
      b. Ceiling plenums.
      c. Pipe spaces.
      d. Duct shafts.
      e. Attic spaces.
   3. Finished metal surfaces include the following:
      a. Anodized aluminum.
      b. Stainless steel.
      c. Chromium plate.
   4. Operating parts include moving parts of operating equipment and the following:
      a. Valve and damper operators.
      b. Linkages.
      c. Sensing devices.
      d. Motor and fan shafts.
   5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

1.2 REFERENCED STANDARDS

A. The referenced standards listed below are considered part of the requirements listed in this section. If specific aspects of the standards do not apply, the Contractor shall identify the specific references in writing prior to beginning work. All requests for omission must be approved by the Architect.
   1. ASTM International (ASTM)
      a. ASTM A 123 Hot-Dip Galvanized Coatings on Iron and Steel Products;
      b. ASTM A 780 - Repair of Hot Dip Galvanized Coatings;
      c. ASTM D 16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2008.
      d. ASTM D 653 Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process;
      e. ASTM D 6386 - Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting;
      f. ASTM D 2092 Preparation of Zinc-Coated (Galvanized) Steel Surfaces for Painting;
      g. ASTM D 4258 Surface Cleaning Concrete for Coating;
      h. ASTM D 4261 Surface Cleaning Concrete Unit Masonry for Coating;
      i. ASTM D 4259 Abrading Concrete;
      j. ASTM F 1869 Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride;
      k. ASTM D 4414 Standard Practice for Measurement of Wet Film Thickness (WFT) by Notch Gages;
      l. ASTM D 5064 Practice for Conducting a Patch Test to Assess Coating Compatibility;
      m. ASTM D 3276 Standard Guide for Painting Inspectors (Metal Substrates);
      n. ASTM D 3359 Adhesion by Tape Test
      o. ASTM D 4261 Surface Cleaning Concrete Unit Masonry for Coating;
      p. ASTM D 4414 Standard Practice for Measurement of Wet Film Thickness (WFT) by Notch Gages;
   2. Society for Protective Coatings (SSPC)

a. SSPC-PA 1 Shop, Field, and Maintenance Painting of Steel;
b. SSPC-PA 2 Measurement of Dry Coating Thickness with Magnetic Gauges;
c. SSPC-SP 2 Hand Tool Cleaning;
d. SSPC-SP 3 Power Tool Cleaning;
e. SSPC Guide 6 Guide for Containing Surface Preparation Debris Generated During Paint Removal Operations;

1.3 DEFINITIONS
A. Terminology as defined in the following standards apply to this section:
1. ASTM D 16 Paint, Related Coatings, Materials, and Applications;
2. ASTM E 284 Appearance;
3. ASTM C 11 Standard Terminology Relating to Gypsum and Related Building Materials and Systems;
4. National Paint & Coatings Association (NPCA) Glossary of Terms as listed at the following URL: www.paint.org/ind_info/terms.cfm;
5. Paint/Coatings Dictionary, © 1978 by Federation of Societies for Coatings Technology.
B. Design Standard: The paint/coating material specifically referenced by manufacturer's name/number, which determines the performance and quality requirements for materials referred in this Section.

1.4 SUBMITTALS
A. Complete and submit the Paint Material Cross Reference List for all paint/coating materials submitted (excluding the Design Standard).
B. Complete and submit the Label Analysis Form for all paint/coating materials submitted (excluding the Design Standard).
C. Environmental Health and Safety Plan (relating to disturbance of paint with hazardous constituents);
D. Containment System Plan.
E. Waste Collection, Handling, Disposal Plan.
F. Manufacturer's Information: Manufacturer's technical information including instructions for handling, storing, surface preparation application, warranty etc.
G. Samples for Initial Selection: For each type of finish-coat material indicated provide a full color palette. After color selection, Architect will furnish a schedule indicating surfaces for each color selected.
H. Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample for each type of coating and substrate required. Comply with procedures specified in PDCA P5. Duplicate finish of approved sample Submittals.
1. Architect will select one room or surface to represent surfaces and conditions for application of each type of coating and substrate.
a. Wall Surfaces: Provide samples on at least one wall.
b. Small Areas and Items: Architect will designate items or areas required.
2. Apply benchmark samples, according to requirements for the completed Work, after permanent lighting and other environmental services have been activated. Provide required sheen, color, and texture on each surface.
a. After finishes are accepted, Architect will use the room or surface to evaluate coating systems of a similar nature.
b. Final approval of colors will be from benchmark samples.
I. Errors, Omissions, and Other Discrepancies
1. Submit all errors, omissions, and other discrepancies in contract documents to the Architect within 30 days of contract award for all work covered in this Section, other than the work that will not be uncovered until a later date. All such discrepancies shall be addressed and resolved, and the work plan modified, prior to beginning the initial and follow-up phases of work. Discrepancies that become apparent only after work is uncovered shall be identified at the earliest discoverable time and submitted for resolution.

1.5 QUALITY CONTROL
A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

1.6 WARRANTY
A. Manufacturer shall provide a minimum 5 year material and labor warranty covering defective materials for all finish systems. If a specific finish system has a standard warranty greater than the 5 year warranty indicated the greater warranty shall apply.

1.7 DELIVERY, STORAGE, AND HANDLING
A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:

1. Product name or title of material.
2. Product description (generic classification or binder type).
3. Manufacturer's stock number and date of manufacture.
4. Contents by volume, for pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.
7. Color name and number.
8. VOC content.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain storage containers in a clean condition, free of foreign materials and residue.
   1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily.

1.8 PROJECT CONDITIONS

A. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F.
B. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F.
C. Do not apply paint in rain, fog, or to damp or wet surfaces.
D. Do not apply when the air or surface is excessively hot resulting in “mud cracking.” If mud cracking occurs an additional coat will be required. Mud cracking is not considered an acceptable condition.
E. Do not apply paint when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F above the dew point.
   1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. The Design Standard paint/coating materials for this Section is The Sherwin Williams Company (SW). Subject to compliance with product submittal/approval requirements, provide one of the products listed in this Section or an equivalent product, as determined by the Architect. Other manufacturers will be considered contingent upon their responsiveness to the requirements set forth in Section

2.2 MATERIALS (GENERAL)

A. Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.
B. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
C. Volatile Organic Compound (VOC) Content: Comply with Section 01 6116.
D. Products shall not exceed the VOC content limits established in the Green Seal Standard GS-11; Paints; Second Edition; May 12, 2008.
   1. Flats; 50g/L
   2. Non-Flats; 100g/L
E. Colors: As selected by Architect.
   1. Number of colors (of pigmented coating) shall be limited to the following:
      a. Hollow metal frames:1
      b. Wood doors:1
      c. Colors for interior 2
      d. Colors per room or space: 1
   2. Approval of the in-place color against approved color chips shall be solely the right and judgment of the Architect.
   3. Each underlying coat shall be tinted lighter than next coat or finish coat. The contrast shall be visible at a distance not less than 10 feet. The degree of contrast can be modified at the discretion of the Architect or appointed designee.

2.3 PRIMERS

A. Exterior Concrete / Stucco Primer:
   1. SW Loxon Conditioner, 100% Acrylic Chalk Binder Pigmented, A24W100.
B. Exterior Metal Panels, Hollow Metal Doors and Frames:
   1. Spot Primer: Sherwin Williams Alkyd Rust Inhibitive Primer, Kem Kromik Universal Primer, B50WZ1.
   2. Bonding Primer: Sherwin Williams, Acrylic Bonding Primer, Adhesion Primer, B51W00450.
C. Interior Door Frames:
   1. Sherwin Williams ProCryl Universal Primer, B66-310 Series

D. Interior Gypsum Wall Board (GWB) :
   1. Sherwin Williams Harmony Interior Latex Primer, B11
E. Interior Wood Doors:
   1. Sherwin Williams PrepRite ProBlock Latex Primer/Sealer, B51 Series

2.4 FINISH COATS
A. Exterior Concrete / Stucco surfaces:
   1. SW SuperPaint Exterior Latex Satin A89W1151
B. Exterior Metal Panels, Doors and Frames.
   1. Sherwin Williams Two Part Water Based Polyurethane, Acrolon 100 WB Urethane, B65W721.
C. Interior Semi-Gloss (Door Frames):
   1. Sherwin Williams Pro Industrial Acrylic Semi-Gloss, B66-650 Series
D. Interior Semi-Gloss (GWB):
   1. Sherwin Williams Harmony Interior Latex Semi-Gloss, B10 Series
E. Interior Semi-Gloss (Wood Doors):
   1. Sherwin Williams Pro Industrial Acrylic Semi-Gloss, B66-605 Series

PART 3 - EXECUTION

3.1 EXAMINATION
A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application. Comply with procedures specified in PDCA P4.
   1. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
   2. Start of painting will be construed as Applicator's acceptance of surfaces and conditions within a particular area.
B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
   1. Notify Architect about anticipated problems when using the materials specified over substrates primed by others.

3.2 TECHNICAL REPRESENTATION BY PAINT MANUFACTURER
A. A qualified technical representative of the paint manufacturers shall periodically visit the site to verify that the quality of surface preparation and painting conform to their requirements. Visits are required at the start of the project and a minimum of two visits during each of the following phases:
   1. Mockup review;
   2. Surface preparation;
   3. Primer application; and,
   4. Finish coat application.
B. The manufacturer's representative shall summarize the results of the inspections in writing and provide recommendations if necessary. The Contractor shall provide copies of the manufacturer's reports to the Owner within seven days after each site visits.
C. The Contractor shall comply with all manufacturers recommendations presented within the report at no additional cost to the Owner.

3.3 PREPARATION
A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.
   1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
B. Cleaning:
   1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
   2. Water Blasting NACE Standard RP-01-72: Removal of oil, grease, dirt, loose rust, loose mill scale, and loose paint by water pressures of 2,000 to 2,5000 psi at a flow of 4 to 14 gallons per minute.
C. Surface Preparation:
   1. Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings in accordance with manufacturer's written instructions for each particular substrate condition and as specified.
   2. Provide barrier coats over incompatible primers or remove and reprime. Typical incompatibility involves epoxy primers that have cured beyond their maximum recoat time.

3. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents from concrete and/or cementitious materials. If chemical compounds have been used to expedite curing, use mechanical methods of surface preparation to enable water to penetrate. Perform water mist testing of new concrete to determine the presence of curing compounds.
4. Previously Painted Stucco: The amount of time between pressure cleaning and primer apllication shall not exceed four (4) days or re-cleaning will be required.
5. If dirt splash along base of a cleaned surface occurs, removal shall be performed via pressure cleaning or scrub brush and water. Dry broom removal is not an acceptable method of cleaning.
6. Determine alkalinity and moisture content of concrete surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces if moisture content exceeds that permitted in manufacturer's written instructions.
7. Previously Coated Surfaces: Maintenance painting will frequently not permit or require the removal of all old coatings prior to repainting. However, all surface contamination such as oil, grease, loose paint, mill scale, dirt, foreign matter, rust, mold, mildew, mortar, efflorescence, and sealers must be removed to assure sound bonding to the tightly adhering old paint. Glossy surfaces of old paint films must be clean and dull before repainting. Thorough washing with an abrasive cleanser will clean and dull in one operation, or wash thoroughly and dull by sanding. Spot prime any bare areas with an appropriate primer. Check for compatibility by applying a test patch of the recommended coating system, covering at least 2 to 3 square feet. Allow to dry one week before testing adhesion per ASTM D3359. If the coating system is incompatible, complete removal is required.

D. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
3. Use only thinners approved by paint manufacturer and only within recommended limits.

E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.4 APPLICATION

A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
1. Existing, painted surfaces shall have a test patch applied in general accordance with ASTM D 5064 Practice for Conducting a Patch Test to Access Coating Compatibility. Coordinate with the Architect as to the location of the test areas and specific requirements. All surfaces painted without the proper testing shall be at the risk of the Contractor and all costs related to refinishing due to compatibility shall be incurred by the Contractor.
2. Paint colors, surface treatments, and finishes are indicated in the paint schedules.
3. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
4. Provide finish coats that are compatible with primers used.
5. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
6. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
7. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
8. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
9. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.
10. Finish interior of wall and base cabinets and similar field-finished casework to match exterior.
11. Sand lightly between each succeeding enamel coat.

B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.

2. Omit primer over metal surfaces that have been shop primed and touchup painted.
3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.

C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.

D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.

E. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

F. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

G. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.5 FIELD QUALITY CONTROL

A. Owner reserves the right to invoke the following test procedure at any time and as often as Owner deems necessary during the period when paint is being applied:
1. Construction Manager will engage a qualified independent testing agency to sample paint material being used. Samples of material delivered to Project will be taken, identified, sealed, and certified in the presence of Subcontractor.
2. Contractor shall remove noncomplying paint from Project site, pay for testing, and repaint surfaces previously coated with the noncomplying paint. If necessary, Contractor may be required to remove noncomplying paint from previously painted surfaces if, on repainting with specified paint, the two coatings are incompatible.

3.6 EXTERIOR PAINT SCHEDULE

A. Exterior Concrete at unconditioned spaces:
1. Primer: SW Loxon Conditioner, 100% Acrylic Chalk Binder Pigmented, A24W100.; apply at WFT range of 8.0 - 10.0 mils to achieve a minimum of 3.0 mils.
2. Patching: Voids in mortar joints and/or CMU shall be filled with a lightweight spackle compound and tooled to match the surrounding texture.
3. Finish Coat: SW SuperPaint Exterior Latex Satin A89W1151; apply at WFT range of 8.0 - 10.0 mils to achieve DFT range of 3.6 - 4.5 mils per coat.
4. Existing surfaces of this type will require Intermediate and Finish coats only provided that the requirements of this specification for evaluation and preparation of existing substrates are met. If existing finish is not compatible then the existing finish shall be removed and shall be treated as a new surface

B. Exterior Stucco Soffits:
1. Primer: SW Loxon Conditioner, 100% Acrylic Chalk Binder Pigmented, A24W100.; apply at WFT range of 8.0 - 10.0 mils to achieve a minimum of 3.0 mils.
2. Finish Coat: SW SuperPaint Exterior Latex Satin A89W1151; apply at WFT range of 8.0 - 10.0 mils to achieve DFT range of 3.6 - 4.5 mils per coat.
3. Existing surfaces of this type will require Intermediate and Finish coats only provided that the requirements of this specification for evaluation and preparation of existing substrates are met. If existing finish is not compatible then the existing finish shall be removed and shall be treated as a new surface.

C. Exterior Cement Plaster Soffits:

1. Primer: Two coats, LOXON Masonry Primer (Sherwin Williams).
2. Finish Coat: One coat, A-100, flat (Sherwin Williams).
3. Existing surfaces of this type will require two Finish coats only provided that the requirements of this specification for evaluation and preparation of existing substrates are met. If existing finish is not compatible then the existing finish shall be removed and shall be treated as a new surface

D. Metal Panels, Doors and Frames:
1. Spot Primer: SW Kem Kromik Universal Primer, B50WZ1
2. Primer: SW, Adhesion Primer, B51W00450; apply at a dry film thickness of not less than 3.0 mils.
3. Finish Coat: SW Acrolon 100 WB Urethane, B65W721.; apply at WFT range of 3.5 - 7.0 mils to achieve DFT range of 2.0 - 4.0 mils. If one coat does not completely cover the primer, apply additional coat.
   a. Note: Primer and Finish Coat shall have a definable contrast between the two colors.

3.7 INTERIOR PAINT SCHEDULE

A. Gypsum Wallboard:
1. Primer: Sherwin Williams Harmony Interior Latex Primer, B11; apply at WFT range of 5.3 - 6.4 mils to achieve DFT range of 0.8 - 1.0 mils.
2. Intermediate Coat: Sherwin Williams Harmony Interior Latex Semi-Gloss, B10 Series; apply at WFT range of 4.0 - 5.0 mils to achieve DFT range of 1.5 - 2.0 mils. Tint 50-percent of finish coat to create definable contrast.
3. Finish Coat: Sherwin Williams Harmony Interior Latex Semi-Gloss, B10 Series; apply at WFT range of 4.0 - 5.0 mils to achieve DFT range of 1.5 - 2.0 mils. Orange peel finish.

B. Existing Interior Walls
1. Intermediate Coat: Sherwin Williams Harmony Interior Latex Semi-Gloss, B10 Series; apply at WFT range of 4.0 - 5.0 mils to achieve DFT range of 1.5 - 2.0 mils. Tint 50-percent of finish coat to create definable contrast.
2. Finish Coat: Sherwin Williams Harmony Interior Latex Semi-Gloss, B10 Series; apply at WFT range of 4.0 - 5.0 mils to achieve DFT range of 1.5 - 2.0 mils. Orange peel finish.

C. Wood Doors:
1. Primer: Sherwin Williams PrepRite ProBlock Latex Primer/Sealer, B51 Series; apply at a DFT of not less than 3.0 mils.
2. Intermediate Coat: Sherwin Williams Pro Industrial Acrylic Semi-Gloss, B66-605 Series; apply at WFT range of 3.5 - 7.0 mils to achieve DFT range of 2.0 - 4.0 mils. If one coat does not completely cover the primer, apply additional coat.
3. Finish Coat: Sherwin Williams Pro Industrial Acrylic Semi-Gloss, B66-605 Series; apply at WFT range of 3.5 - 7.0 mils to achieve DFT range of 2.0 - 4.0 mils. If one coat does not completely cover the primer, apply additional coat.

D. Ferrous Metal Door Frames:
1. Primer: Sherwin Williams ProCryl Universal Primer, B66-310 Series; apply at a DFT of not less than 3.0 mils.
2. Finish Coat: Sherwin Williams Pro Industrial Acrylic Semi-Gloss, B66-650 Series; apply at WFT range of 3.5 - 7.0 mils to achieve DFT range of 2.0 - 4.0 mils. If one coat does not completely cover the primer, apply additional coat.
   a. Note: Primer and Finish Coat shall have a definable contrast between the two colors.

3.8 CLEANING

A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.
1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

3.9 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.

B. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.
1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

PAINT MATERIAL CROSS REFERENCE LIST

PROVIDE A LABEL ANALYSIS AS SHOWN IN THE EXAMPLE BELOW. THIS LIST IS REQUIRED AS PART OF THE SUBMITTALS.

SPEC SECTION	GENERIC DESCRIPTION	PRODUCT NAME	PRODUCT NO.	SUBSTRATE(S)	LOCATION(S)
2.4,A, 1 (E.G.)	INTERIOR SEMI-GLOSS (E.G.)	PREMIUM INTERIOR SEMI-GLOSS (E.G)	GLN64XX (E.G.)	DRYWALL (FINISH), (E.G.)	INTERIOR WALLS (E.G.)

CONTINUE ROWS AS REQUIRED BY THE SUBMITTAL.

LABEL ANALYSIS FORM

PROVIDE A LABEL ANALYSIS AS SHOWN IN THE EXAMPLE BELOW. THIS LIST IS REQUIRED AS PART OF THE SUBMITTALS WHEN THE DESIGN STANDARD IS NOT PROVIDED. PROVIDE THE FOLLOWING DATA:

PRODUCT NAME:	PRODUCT NUMBER:	MANUFACTURER:

COMPOSITION BY WEIGHT:

WEIGHT PER GALLON:	LBS.	P.V.C.	%
SOLIDS BY WEIGHT:	%	SOLIDS BY VOLUME:	%
TOTAL PIGMENT:	%	TOTAL VEHICLE:	%

LIST COMPONENTS COMPRISING PIGMENT. QUANTIFY COMPONENTS NO PROVIDED (I.E. EXTENDER PIGMENTS, ANTI-CORROSIVES, ETC.).	LIST COMPONENTS COMPRISING VEHICLE. QUANTIFY COMPONENTS NO PROVIDED (I.E. ADDITIVES, FUNGICIDE, BIOCIDE, ETC.).

TITANIUM OXIDE (TIO2)	**%**	**ACRYLIC RESIN (SOLIDS)**	**%**
ZINC OXIDE	**%**	**ALKYD RESINS (SOLIDS)**	**%**
CALCIUM CARBONATE	**%**	**VINYL/ACRYLIC CO-POLYMER**	**%**
SILICATES	**%**	**POLYVINYL ACETATE (P.V.A.)**	**%**
MISCELLANEOUS FELDSPARS	**%**	**ETHYLENE GLYCOL**	**%**
	%	**VOLATILE (WATER)**	**%**
	%	**VOLATILE (SOLVENT)**	**%**
	%		**%**
	%		**%**
	%		**%**
TOTAL	**100 %**	**TOTAL**	**100 %**

VOLATILE ORGANIC COMPOUND (V.O.C.) AS SUPPLIED ?	**LBS/GAL**	**G/L**

FINISH OR TOP COAT PRODUCTS

WHAT IS THE 60 DEGREE ANGULAR SHEEN (SATIN OR HIGHER)	**UNITS**
WHAT IS THE 85 DEGREE ANGULAR SHEEN (FLAT OR MATTE FINISHES)	**UNITS**
IS THE PRODUCT OFF-CASTED (PIGMENTS ADDED TO INCREASE HIDING POWER)?	
IF COLORS ARE FACTORY ADDED, WHAT PIGMENT IS USED?	

END OF SECTION

SECTION 10165 - PLASTIC LAMINATE TOILET COMPARTMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES
- A. Plastic laminate toilet compartments.
- B. Urinal screens.

1.2 RELATED REQUIREMENTS
- A. Section 06100 - Rough Carpentry: Blocking and supports.
- B. Section 10800 - Toilet, Bath, and Laundry Accessories.

1.3 REFERENCE STANDARDS
- A. ANSI A208.1 - American National Standard for Particleboard.
- B. NEMA LD 3 - High-Pressure Decorative Laminates; National Electrical Manufacturers Association.

1.4 ADMINISTRATIVE REQUIREMENTS
- A. Coordination: Coordinate the work with placement of support framing and anchors in walls and ceilings.

1.5 SUBMITTALS
- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Manufacturer's Installation Instructions: Indicate special procedures.

PART 2 PRODUCTS

2.1 MANUFACTURERS
- A. Plastic Laminate Toilet Compartments:
  1. General Partitions Mfg. Corp; ____: www.generalpartitions.com.
  2. Substitutions: Section 01600 - Product Requirements.

2.2 MATERIALS
- A. Particleboard for Core: ANSI A208.1; composed of wood chips, sawdust or flakes, made with waterproof resin binder; of grade to suit application; sanded faces.
- B. Plastic Laminate: NEMA LD 3, HGS.

2.3 COMPONENTS
- A. Toilet Compartments: Plastic laminate finished, floor-mounted unbraced.
- B. Doors, Panels, and Pilasters: Plastic laminate adhesive and pressure bonded to faces and edges of particleboard core, with beveled corners and edges; edges of cut-outs sealed.
  1. Plastic Laminate Colors: Color as selected for doors, color as selected for panels, finish as selected.
- C. Door and Panel Dimensions:
  1. Thickness: 1 inch.
  2. Door Width: 24 inch.
  3. Door Width for Handicapped Use: 36 inch, out-swinging.
  4. Height: 58 inch.
- D. Urinal Screens: Wall mounted with two panel brackets, and floor-to-ceiling vertical upright consisting of pilaster anchored to floor and ceiling.

2.4 ACCESSORIES
- A. Pilaster Shoes: Formed chromed steel with polished finish, 3 inches high, concealing floor fastenings.
  1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.
- B. Head Rails: Hollow chrome plated steel tube, 1 x 1-5/8 inch size, with anti-grip strips and cast socket wall brackets.
- C. Pilaster Brackets: Polished stainless steel.
- D. Wall Brackets: Continuous type, polished stainless steel.
- E. Hardware: Polished stainless steel:
  1. Pivot hinges, gravity type, adjustable for door close positioning; two per door.
  2. Thumb turn door latch with exterior emergency access feature.
  3. Door strike and keeper with rubber bumper; mounted on pilaster in alignment with door latch.
  4. Coat hook with rubber bumper; one per compartment, mounted on door.
  5. Provide door pull for outswinging doors.

PART 3 EXECUTION

3.1 EXAMINATION
- A. Verify that field measurements are as indicated.
- B. Verify correct spacing of and between plumbing fixtures.
- C. Verify correct location of built-in framing, anchorage, and bracing.

3.2 INSTALLATION
- A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.
- B. Maintain 3/8 to 1/2 inch space between wall and panels and between wall and end pilasters.
- C. Attach panel brackets securely to walls using anchor devices.
- D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.

3.3 TOLERANCES
- A. Maximum Variation From True Position: 1/4 inch.
- B. Maximum Variation From Plumb: 1/8 inch.

3.4 ADJUSTING
- A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.
- B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.

END OF SECTION

SECTION 10431 - SIGNS

PART 1 - GENERAL

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

1.2 SUMMARY
- A. This Section includes the following:
  1. Panel signs.
  2. Dimensional characters (letters and numbers) for exterior use.
  3. Signage accessories.
  4. Related Sections include the following:
     a. Division 15 Section "Mechanical Identification" for labels, tags, and nameplates for mechanical equipment.
     b. Division 16 Section for labels, tags, and nameplates for electrical equipment.

1.3 SUBMITTALS
- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of sign.
- B. Shop Drawings:
  1. Provide message list for each sign, including large-scale details of wording, lettering, and Braille layout.
- C. Samples for Initial Selection: For each type of sign material indicated that involves color selection.
- D. Samples for Verification: For each type of sign, include the following Samples to verify color selected:
  1. Panel Signs: Full-size Samples of each type of sign required.
  2. Dimensional Characters: Full-size Samples of each type of dimensional character (letter and number) required. Show character style, material, finish, and method of attachment.
  3. Casting: Show representative texture, character style, spacing, finish, and method of attachment.
  4. Approved samples will be returned for installation into Project.

1.4 QUALITY ASSURANCE
- A. Source Limitations: Obtain each sign type through one source from a single manufacturer.
- B. Regulatory Requirements: Comply with the Americans with Disabilities Act (ADA) and with code provisions as adopted by authorities having jurisdiction.

1.5 COORDINATION
- A. For signs supported by or anchored to permanent construction, advise installers of anchorage devices about specific requirements for placement of anchorage devices and similar items to be used for attaching signs.
  1. For signs supported by or anchored to permanent construction, furnish templates for installation of anchorage devices.
  2. Provide paper mock up of all signs in locations with text and numbering indicated for review by Architect and Owner prior to manufacture and installation of signs.

PART 2 - PRODUCTS

2.1 PANEL SIGNS
- A. General: Provide panel signs that comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.
  1. Produce smooth panel sign surfaces constructed to remain flat under installed conditions within tolerance of plus or minus 1/16 inch measured diagonally.
  2. Cast-Acrylic Sheet: Manufacturer's standard and as follows:
     a. Color: As selected by Architect from manufacturer's full range.
     b. Architect shall have the option to choose multiple colors for signage based on, but not limited to:
        1) The number of buildings on the campus.
  3. Plastic Laminate: Provide high-pressure laminate engraving stock with face and core plies in high contrast colors as selected by Architect from manufacturer's full range.
  4. Unframed Panel Signs: Fabricate signs with edges mechanically and smoothly finished to comply with the following requirements:
     a. Edge Condition: Bevelled.
     b. Corner Condition: 1/2" Radius.
  5. Laminated Panels: Permanently laminate face panels to backing sheets of material; use manufacturer's standard process.

6. Graphic Content and Style: Provide sign copy that complies with requirements indicated in the Sign Schedule for size, style, spacing, content, mounting height and location, material, finishes, and colors of signage.
7. Tactile and Braille Copy: Produce copy complying with ADA Accessibility Guidelines and ICC/ANSI A117.1. Text shall be accompanied by Grade 2 Braille. Produce precisely formed characters with square cut edges free from burrs and cut marks.
   a. Panel Material: Opaque acrylic sheet.
   b. Raised Copy Thickness: Not less than 1/32 inch.
   c. Braille: raised Braille copy shall be integral with the sign panel. Chemically welded 'BBs' are not permitted.
   d. Alignment: Where signs are located at right-handed latches, align text and braille copy left. Where signs are located at left-handed latches, align text and braille copy right.

2.2 DIMENSIONAL CHARACTERS
A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of 6063-T5.

2.3 ACCESSORIES
A. Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.4 FINISHES, GENERAL
A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
B. Protect mechanical finishes on exposed surfaces from damage by applying strippable, temporary protective covering before shipping.
C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION
A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
B. Verify that items, including anchor inserts, provided under other sections of Work are sized and located to accommodate signs.
C. Examine supporting members to ensure that surfaces are at elevations indicated or required to comply with authorities having jurisdiction and are free from dirt and other deleterious matter.
D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION
A. General: Locate signs and accessories where indicated, using mounting methods of types described and in compliance with manufacturer's written instructions.
   1. Install signs level, plumb, and at heights indicated, with sign surfaces free from distortion and other defects in appearance.
   2. Interior Wall Signs:
      a. Refer to drawings for typical mounting configurations and dimensions.
   3. Wall-Mounted Panel Signs: Attach panel signs to wall surfaces using methods indicated below:
      a. Mechanical Fasteners: Use tamper-proof, flush mounted, SS mechanical fasteners placed through predrilled holes. Attach signs with fasteners and anchors suitable for secure attachment to substrate as recommended in writing by sign manufacturer.
         1) Mid point fasteners: on signs 14" wide or greater. Mid-point fasteners shall align with block coursing where applicable.
         2) Tolerance: Less than or equal to 1/32". Panel signs must be mounted flush with the wall surface.
         3) Sealant: mount signs in a bed of sealant.
   4. Silicone-Adhesive Mounting Where Mounted on Glass: Use liquid-silicone adhesive recommended in writing by sign manufacturer to attach signs to irregular, porous, or vinyl-covered surfaces. Use double-sided vinyl tape where recommended in writing by sign manufacturer to hold sign in place until adhesive has fully cured.

a. Where panel signs are scheduled or indicated to be mounted on glass, provide matching plate on opposite side of glass to conceal mounting materials.
b. Where panel signs are scheduled or indicated to be mounted on glass, do not provide holes for mechanical fasteners in the sign panel. Provide solid panel sign and matching plate.

5. Dimensional Characters: Mount characters using standard fastening methods recommended in writing by manufacturer for character form, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish character spacing and to locate holes for fasteners.
   a. Flush Mounting: Mount characters with backs in contact with wall surface.
6. Cast-Metal Plaques: Mount plaques using standard fastening methods recommended in writing by manufacturer for type of wall surface indicated.
   a. Concealed Mounting: Mount plaques by inserting threaded studs into tapped lugs on back of plaque. Set in predrilled holes filled with quick-setting cement.

3.3 CLEANING AND PROTECTION

A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.

3.4 SIGN SCHEDULE

A. Not an Exit Sign (Sign Type A):
   1. Material: Plastic laminate.
   2. Perimeter: Unframed.
   3. Copy: Tactile and Braille.
   4. Character Style: Sans Serif.
   5. Sign Text: NOT AN EXIT AUTHORIZED PERSONNEL ONLY
   6. Message: Fixed.
   7. Sizes: See drawings.
   8. Sign Location: See Drawings
B. Maximum Occupancy Signs (Sign Type B):
   1. Material: Plastic laminate.
   2. Perimeter: Unframed.
   3. Copy: Raised.
   4. Character Style: Sans Serif.
   5. Sign Text: MAXIMUM OCCUPANCY XXX
   6. Message: Fixed.
   7. Size: See Drawings.
      a. Character: Minimum 1-inch high characters.
      b. Colors:
         1) Character: White.
         2) Background: Red.
      c. Sign location: See Drawings.
C. Fire ExtinguisherSign (Sign Type E):
   1. Material: Plastic laminate.
   2. Perimeter: Unframed.
   3. Copy: Raised.
   4. Character Style: Sans Serif.
   5. Sign Text: FIRE EXTINGUISHER
   6. Message: Fixed.
   7. Size: See Drawings.
D. Room Number Signs (Sign Type F):
   1. Material: Plastic laminate.
   2. Perimeter: Unframed.
   3. Copy: Raised.
   4. Character Style: Sans Serif.
   5. Sign Text: See opening schedule.
   6. Message: Fixed.
   7. Size: See drawings

END OF SECTION

SECTION 10520 - FIRE-PROTECTION SPECIALTIES

PART 1 - GENERAL

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

1.2 SUMMARY
- A. This Section includes the following:
  1. Portable fire extinguishers.
  2. Fire-protection cabinets for the following:
     a. Portable fire extinguishers.
  3. Fire-protection accessories.

1.3 SUBMITTALS
- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection specialties.
  1. Fire Extinguishers: Include rating and classification.
  2. Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available for each type of cabinet finish indicated.
- C. Maintenance Data: For fire extinguishers and fire-protection cabinets to include in maintenance manuals.

1.4 QUALITY ASSURANCE
- A. Source Limitations: Obtain fire extinguishers and cabinets through one source from a single manufacturer.
- B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Standard for Portable Fire Extinguishers."
- C. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
  1. Extinguishers shall have a current inspection tag at date of substantial completion.
- D. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements of ASTM E 814 for fire-resistance rating of walls where they are installed.

1.5 COORDINATION
- A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated as efficiently as possible to minimize cabinet size.

1.6 WARRANTY
- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of portable fire extinguishers that fail in materials or workmanship within specified warranty period.
  1. Failures include, but are not limited to, the following:
     a. Failure of hydrostatic test according to NFPA 10.
     b. Faulty operation of valves or release levers.
  2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS
- A. Cold-Rolled Steel Sheet: Carbon steel, complying with ASTM A 366/A 366M, commercial quality, stretcher leveled, temper rolled.
- B. Stainless Steel: #8 SS.

2.2 PORTABLE FIRE EXTINGUISHERS
- A. General: Provide fire extinguishers of type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.
  1. All extinguishers must be made of metal (no plastic) parts on the valve mechanism.
  2. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging.
- B. Dry-Chemical Type: UL-rated 40-B:C, 10-lb (4.5-kg) nominal capacity, in enameled-steel container.
- C. Multipurpose Dry-Chemical Type: UL-rated 4-A:80-B:C, 10-lb nominal capacity, in enameled-steel container.

D. Carbon-Dioxide Type: UL-rated 10-B:C, 20-lb (4.5-kg) nominal capacity, in manufacturer's standard enameled-metal container.

2.3 FIRE-EXTINGUISHER CABINETS

A. Cabinet Construction: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth. Miter and weld perimeter door frames.
   1. Cabinet Metal: Steel sheet.
   2. Shelf: Same metal and finish as cabinet.
B. Cabinet Type: Suitable for the following:
   1. Fire extinguisher as scheduled.
   2. Semi-Recessed Basis of Design: Larsen 2409-6R.
   3. Basis of Design: Larsen FS-2409-6R.
      a. Provide fire rated cabinet to maintain rated walls.
C. Cabinet Mounting: Suitable for the following mounting conditions:
   1. Semirecessed: Cabinet box partially recessed in walls of shallow depth to suit style of trim indicated.
D. Cabinet Trim Style: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.
   1. Exposed Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
      a. Rolled-Edge Trim: 2-1/2-inch backbend depth.
E. Cabinet Trim Material: Manufacturer's standard, as follows:
   1. Stainless steel.
F. Door Material: Manufacturer's standard, as follows:
   1. Stainless steel.
G. Door Style: Manufacturer's standard design, as follows:
   1. Solid opaque panel with frame.
   2. Die Cut Lettering Style: Type A, vertical engraved letters: "FIRE EXTINGUISHER".
      a. Color: anodized aluminum.
H. Door Construction: Fabricate doors according to manufacturer's standards, of materials indicated, and coordinated with cabinet types and trim styles selected.
   1. Provide minimum 1/2-inch thick door frames, fabricated with tubular stiles and rails, and hollow-metal design.
I. Door Hardware: Provide manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide either lever handle with cam-action latch, or exposed or concealed door pull and friction latch. Provide concealed or continuous-type hinge permitting door to open 180 degrees.

2.4 ACCESSORIES

A. Mounting Brackets: Manufacturer's standard steel, designed to secure extinguisher, of sizes required for types and capacities of extinguishers indicated, with plated or baked-enamel finish.
   1. Provide brackets for extinguishers not located in cabinets.
B. Identification: Provide lettering to comply with authorities having jurisdiction for letter style, color, size, spacing, and location. Locate as indicated by Architect.
   1. Identify fire extinguisher in cabinet with the words "FIRE EXTINGUISHER" applied to door.
      a. Application Process: Engraved.
      b. Orientation: Vertical

2.5 COLORS AND TEXTURES

A. Colors and Textures: As selected by Architect from manufacturer's full range for these characteristics.

2.6 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
D. Cabinet and Door Finishes: Provide manufacturer's standard baked-enamel paint for the following:
   1. Exterior of cabinets and doors, except for those surfaces indicated to receive another finish.
   2. Interior of cabinets and doors.

PART 3 - EXECUTION

3.1 EXAMINATION
- A. Examine roughing-in for cabinets to verify actual locations before cabinet installation.
- B. Examine walls and partitions for suitable framing depth and blocking where recessed cabinets are to be installed.
- C. Examine fire extinguishers for proper charging and tagging.
  1. Remove and replace damaged, defective, or undercharged units.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION
- A. Prepare recesses for semirecessed fire-protection cabinets as required by type and size of cabinet and trim style.
- B. Prepare wall for mounting of cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION
- A. General: Install fire-protection specialties in locations and at mounting heights indicated on drawings or, if not indicated, at heights indicated below:
  1. Fire-Protection Cabinets: 54 inches above finished floor to top of cabinet.
  2. Mounting Brackets: 54 inches above finished floor to top of fire extinguisher.
- B. Fire-Protection Cabinets: Fasten fire-protection cabinets to structure, square and plumb.
- C. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

3.4 INSTALLATION OF FIRE-RATED CABINETS
- A. Seal through penetrations with firestopping sealant as specified in Division 7 Section "Through-Penetration Firestop Systems."

3.5 ADJUSTING, CLEANING, AND PROTECTION
- A. Remove temporary protective coverings and strippable films, if any, as fire-protection specialties are installed, unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet manufacturer.
- E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.
- F. All extinguishers must be provided with a current inspection tag, by the Contractor, prior to substantial acceptance.

3.6 FIRE-PROTECTION SCHEDULE
- A. Fire extinguisher FE1: Where this designation is indicated, provide the following:
  1. Fire extinguisher Type: Multipurpose Dry-Chemical, UL-rated 4-A:80-B:C.
  2. Mounting: Semirecessed Cabinet. (2409-6R)
- B. Fire extinguisher FE2: Where this designation is indicated, provide the following:
  1. Fire extinguisher Type: Dry-Chemical, UL-rated 40-B:C.
  2. Mounting: Mounting Bracket.

END OF SECTION

SECTION 10651 - OPERABLE PANEL PARTITIONS

PART 1 GENERAL

1.1 SECTION INCLUDES
- A. Folding panel partitions.
- B. Ceiling track, ceiling guards, and operating hardware.

1.2 RELATED REQUIREMENTS
- A. Section 06100 - Rough Carpentry: Wood blocking and track support shimming.

1.3 SUBMITTALS
- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on partition materials, operation, hardware and accessories, and colors and finishes available.
- C. Shop Drawings: Indicate opening sizes, track layout, details of track and required supports, static and dynamic loads, location and details of pass door and frame, adjacent construction and finish trim, and stacking depth.

1.4 QUALITY ASSURANCE
- A. Manufacturer Qualifications: Company specializing in manufacturing products specified this section with minimum three years of documented experience.

PART 2 PRODUCTS

2.1 MANUFACTURERS
- A. Manufacturers:
  1. Hufcor, Inc: www.hufcor.com.
  2. Modernfold, a DORMA Group Company: www.modernfold.com.
  3. Panelfold, Inc: www.panelfold.com.
  4. Substitutions: See Section 01600 - Product Requirements.

2.2 COMPONENTS
- A. Operable Panel Partition: Side opening; paired panels; side stacking; manually operated.
  1. Panel Finish: Vinyl coated fabric specified in Section 09720.
  2. Sound Transmission Class (STC): 41-45 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90, on panel size of 100 sq ft.
- B. Panel Construction:
- C. Core: 16 gage, 0.0598 inch thick formed sheet steel frame top, bottom, jambs, and intermediates; welded construction, with acoustical insulation fill.
  1. Thickness with Finish: 3 inches.
  2. Factory applied surface finish.
  3. Trim: Trimless.
  4. Hinges: Continuous piano type, low profie, stainless steel.
  5. Panel to Panel Seals: Grooved and gasketed astragals, with continuous flexible ribbed vinyl seal fitted to panel edge construction; color to match panel finish.
- D. Track: Formed steel; 1-1/4 by 1-1/4 inch size; thickness and profile designed to support loads, steel sub-channel and track connectors, and track switches.
- E. Carriers: Nylon wheels on trolley carrier at top of every second panel, sized to carry imposed loads, with threaded pendant bolt for vertical adjustment.
- F. Hardware: Latching door handles of cast steel, satin chrome finish; lock cylinder keyed to building keying system.
- G. Acoustic Seals: Flexible acoustic seals at jambs, meeting mullions, ceilings, retractable floor and ceiling seals, and above track to structure acoustic seal.
- H. Vinyl Coated Fabric:, polyvinyl fluoride finish for washability and improved flame retardancecolor as selected from manufacturer's standard range.
- I. Pass Door: Single door, 36 inch wide x 84 inch high opening; same design and construction as panel; fit door with perimeter acoustic gaskets, concealed closer, keyed lock, and tool operated floor seal.

PART 3 EXECUTION

3.1 EXAMINATION
- A. Verify that field measurements are as indicated.

3.2 INSTALLATION
A. Install partition in accordance with manufacturer's instructions and ASTM E557.

3.3 ADJUSTING
A. Adjust partition assembly to provide smooth operation from stacked to full open position. Do not over-compress acoustic seals.
B. Visually inspect partition in full extended position for light leaks to identify a potential acoustical leak.
C. Adjust partition assembly to achieve lightproof seal.

3.4 CLEANING
A. Clean finish surfaces and partition accessories.

3.5 CLOSEOUT ACTIVITIES
A. Demonstrate operation of partition and identify potential operational problems.

END OF SECTION

SECTION 10801 - TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

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

1.2 SUMMARY
- A. This Section includes the following:
  1. Toilet and bath accessories.
  2. Changing room accessories.
  3. Underlavatory guards.
- B. Related Sections include the following:
  1. Section 10155 - Toilet Compartments.

1.3 SUBMITTALS
- A. Product Data: Include construction details, material descriptions and thicknesses, dimensions, profiles, fastening and mounting methods, specified options, and finishes for each type of accessory specified.
- B. Setting Drawings: For cutouts required in other work; include templates, substrate preparation instructions, and directions for preparing cutouts and installing anchoring devices.
- C. Maintenance Data: For accessories to include in maintenance manuals specified in Division 1. Provide lists of replacement parts and service recommendations.

1.4 QUALITY ASSURANCE
- A. Source Limitations: Provide products of same manufacturer for each type of accessory unit and for units exposed to view in same areas, unless otherwise approved by Architect.
- B. Product Options: Accessory requirements, including those for materials, finishes, dimensions, capacities, and performance, are established by specific products indicated in the Toilet and Bath Accessory Schedule.
  1. Products of other manufacturers listed in Part 2 with equal characteristics, as judged solely by Architect, may be provided.
  2. Do not modify aesthetic effects, as judged solely by Architect, except with Architect's approval. Where modifications are proposed, submit comprehensive explanatory data to Architect for review.

1.5 COORDINATION
- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by disabled persons, proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.6 WARRANTY
- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Manufacturer's Mirror Warranty: Written warranty, executed by mirror manufacturer agreeing to replace mirrors that develop visible silver spoilage defects within minimum warranty period indicated.
  1. Minimum Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
- A. Manufacturers: Subject to compliance with requirements, provide accessories by one of the following:
  1. Toilet and Bath Accessories:
     a. American Specialties, Inc.
     b. Bobrick Washroom Equipment, Inc.
     c. McKinney/Parker Washroom Accessories Corp.
  2. Underlavatory Guards:
     a. Brocar Products, Inc.
     b. Truebro, Inc.

2.2 MATERIALS
- A. Stainless Steel: ASTM A 666, Type 304, with No. 4 finish (satin), in 0.0312-inch minimum nominal thickness, unless otherwise indicated.
- B. Brass: ASTM B 19, leaded and unleaded flat products; ASTM B 16 (ASTM B 16M), rods, shapes, forgings, and flat products with finished edges; ASTM B 30, castings.

C. Sheet Steel: ASTM A 366/A 366M, cold rolled, commercial quality, 0.0359-inch minimum nominal thickness; surface preparation and metal pretreatment as required for applied finish.
D. Galvanized Steel Sheet: ASTM A 653/A 653M, G60 (Z180).
E. Mirror Glass: ASTM C 1036, Type I, Class 1, Quality q2, nominal 6.0 mm thick, with silvering, electroplated copper coating, and protective organic coating complying with FS DD-M-411.
F. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
G. Fasteners: Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.

2.3 FABRICATION
A. General: One, maximum 1-1/2-inch diameter, unobtrusive stamped manufacturer logo, as approved by Architect, is permitted on exposed face of accessories. On interior surface not exposed to view or back surface of each accessory, provide printed, waterproof label or stamped nameplate indicating manufacturer's name and product model number.
B. Surface-Mounted Toilet Accessories: Unless otherwise indicated, fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with continuous stainless-steel hinge. Provide concealed anchorage where possible.
C. Recessed Toilet Accessories: Unless otherwise indicated, fabricate units of all-welded construction, without mitered corners. Hang doors and access panels with full-length, stainless-steel hinge. Provide anchorage that is fully concealed when unit is closed.
D. Framed Glass-Mirror Units: Fabricate frames for glass-mirror units to accommodate glass edge protection material. Provide mirror backing and support system that permits rigid, tamper-resistant glass installation and prevents moisture accumulation.
1. Provide galvanized steel backing sheet, not less than 0.034 inch and full mirror size, with nonabsorptive filler material. Corrugated cardboard is not an acceptable filler material.
E. Mirror-Unit Hangers: Provide mirror-unit mounting system that permits rigid, tamper- and theft-resistant installation, as follows:
1. Heavy-duty wall brackets of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
F. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION
A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
B. Secure mirrors to walls in concealed, tamper-resistant manner with special hangers, toggle bolts, or screws. Set units level, plumb, and square at locations indicated, according to manufacturer's written instructions for substrate indicated.
C. Install grab bars to withstand a downward load of at least 250 lbf, when tested according to method in ASTM F 446.

3.2 ADJUSTING AND CLEANING
A. Adjust accessories for unencumbered, smooth operation and verify that mechanisms function properly. Replace damaged or defective items.
B. Remove temporary labels and protective coatings.
C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

3.3 TOILET AND BATH ACCESSORY SCHEDULE
A. Paper Towel Dispenser: Where this designation is indicated, provide stainless-steel paper towel dispenser complying with the following:
1. American Specialties, Model 8522
2. Surface-Mounted Roll Paper Towel Type, to hold 9" wide, 800' long standard towels.
B. Hand Dryer
1. Xclerator, Model XL-BW, White Thermoset Polymer
C. Toilet Tissue Dispenser: Where this designation is indicated, provide toilet tissue dispenser complying with the following:
1. Tough Guy, Model #3P914.
a. Type: Triple-post
b. Mounting: Surface mounted with concealed anchorage.
c. Material: heavy-gauge chrome-plated steel with bright polished finish.

d. Capacity: Designed for 4-1/2- diameter-core tissue rolls.

D. Waste Receptacle: Where this designation is indicated, provide stainless-steel seat cover dispenser complying with the following:
   1. Basis of Design: Bobrick B-221
   2. Open-front, surface mount.

E. Soap Dispenser: Where this designation is indicated, provide soap dispenser complying with the following:
   1. Palmer Fixture Company, Model SD0030
   2. Liquid Soap Dispenser, Vertical-Tank Type: Surface-mounted type, minimum 30-oz. capacity tank.
      a. Translucent body.
      b. Mount above hand sink or lavatory.

F. Grab Bar: Where this designation is indicated, provide stainless-steel grab bar complying with the following:
   1. Basis of Design: Bobrick Series B-6806 at accessible toilet rooms.
      a. Length: 36", B6806x36.
      b. Length: 42", B6806x42.
   2. Basis of Design: Bobrick Series B-6861 at accessible (36" x 36") showers.
   3. Stainless-Steel Nominal Thickness: Minimum 0.05 inch
   4. Mounting: Concealed with manufacturer's standard flanges and anchors.
   5. Gripping Surfaces: Smooth, satin finish.
   6. Outside Diameter: 1-1/2 inches for heavy-duty applications.

G. Sanitary Napkin Dispenser: Where this designation is indicated, provide stainless-steel sanitary napkin vendor complying with the following:
   1. Basis of Design: Bobrick B-43500
   2. General: Fabricate cabinet of all-welded construction. Provide seamless door with returned edges and secured by tumbler lockset. Provide identification reading "Napkins" and "Tampons"; brand-name advertising is not allowed. Capacity not less than 30 napkins and 20 tampons.
   3. Mounting: Fully recessed type designed for nominal 4-inch wall depth.
   4. Operation: Single-coin operation, 25 cents.

H. Sanitary Napkin Disposal Unit: Where this designation is indicated, provide stainless-steel sanitary napkin disposal unit complying with the following:
   1. Surface-Mounted Type, TBA-10C: With seamless exposed walls; self-closing top cover; locking bottom panel with stainless-steel, continuous hinge; and removable, reusable receptacle.
      a. Basis of Design: Bobrick B-254

I. Folding Changing Room Seat: Wall-mounted surface; welded tubular seat frame, structural support members, hinges and mechanical fasteners of Type 304 stainless steel, rectangular seat.
   1. Seat: Phenolic or polymeric composite one-piece seat or seat slats, of white color.
   2. Size: 15 13/16" by 25 1/2".
   3. Basis of Design: Bobrick B-5193.

J. Mirror Unit: Where this designation is indicated, provide mirror unit complying with the following:
   1. Basis of Design: Bobrick B-165-2460.
   2. Stainless-Steel, Channel-Framed Mirror: Fabricate frame from stainless-steel channels in manufacturer's standard satin or bright finish with square corners mitered to hairline joints and mechanically interlocked.

K. Mop and Broom Holder: Where this designation is indicated, provide mop and broom holder complying with the following:
   1. Basis of Design: Bobrick B-223x24.
   2. Mop and Broom Holder: 24-inch long unit fabricated of minimum nominal 0.0375-inch thick, stainless-steel hat channel with four spring-loaded, rubber, cam-type, mop/broom holders.

L. Underlavatory Guard: Where this designation is indicated, provide underlavatory guard complying with the following:
   1. Insulating Piping Coverings: White, antimicrobial, molded-vinyl covering for supply and drain piping assemblies intended for use at accessible lavatories to prevent direct contact with and burns from piping. Provide components as required for applications indicated with flip tops at valves that allow service access without removing coverings.

END OF SECTION

SECTION 10950 - MISCELLANEOUS SPECIALTIES

PART 1 - GENERAL

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

1.2 SUMMARY
- A. Provide miscellaneous specialties and related items as required to complete work indicated on Drawings and specified herein. This section includes following:
  1. Projection Screen
  2. Security Drawer
  3. Speaker Box

1.3 SUBMITTALS
- A. Submit product data, shop drawings and samples for each specialty item scheduled for review / approval by Owner and Architect.

1.4 QUALITY ASSURANCE
- A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication where necessary to ensure proper fitting of work.
- B. Inserts and Anchorages: Furnish inserts and anchoring devices. Provide setting drawings, templates, instructions and directions for installation of anchorage devices. Coordinate delivery with other work to avoid delay.

PART 2 - PRODUCTS

2.1 PROJECTION SCREEN (E01)
- A. Provide the following components, as manufactured by Draper Inc. :
  1. Electrically Operated, Recessed Ceiling Mounted, Projection Screen, Model 139007
     a. Description:
        1) AV Format
        2) Image Area: 84" x 108"
        3) Surface Material: Matt White XT1000E

2.2 SECURITY DRAWER (E09)
- A. Provide the following drawer as manufactured by Shuresafe Manufacturing Corporation.
  1. Full Length Security Drawer, Model 670150
     a. Brushed Stainless Steel.

2.3 SPEAKER BOX (E10)
- A. Provide the following speaker as manufactured by Norcon.
  1. Talk Thru Intercom, Level 3 Bullet Proof Version, Model TTU-1AB

PART 3 - EXECUTION

3.1 EXAMINATION
- A. Examine surfaces to which equipment will be attached, with the Installer present, for compliance with product requirements.

3.2 INSTALLATION
- A. Install equipment plumb and level, in locations and with mountings shown. Securely attach to supporting structure, according to manufacturer's written installation instructions.
  1. At frame partitions, provide wood blocking at all connections or fasteners.

3.3 CLEANING AND PROTECTING
- A. At completion of installation, clean surfaces according to manufacturer's written instructions.
  1. Protect installed equipment from damage until acceptance by Owner at the time of Substantial Completion.

END OF SECTION

SECTION 11131 - PROJECTION SCREENS

PART 1 GENERAL

1.1 SECTION INCLUDES
- A. Front projection screen assemblies.

1.2 RELATED REQUIREMENTS
- A. Section 06100 - Rough Carpentry: Wood blocking in walls and ceilings.

1.3 SUBMITTALS
- A. See Section 01330 -Submittal Procedures.
- B. Product Data: Manufacturer's catalog cuts and descriptive information on each product to be used, including:
  1. Preparation instructions and recommendations.
  2. Storage and handling requirements and recommendations.
  3. Installation methods.
- C. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Hillsborough County Sheriff's Office's name and registered with manufacturer.

1.4 QUALITY ASSURANCE
- A. Manufacturer Qualifications: Experienced in manufacturing products specified in this section.
- B. Installer Qualifications: Experienced in installation of the work of this section.

1.5 DELIVERY, STORAGE, AND HANDLING
- A. Deliver projection screens to project site in manufacturer's original unopened packaging. Inspect for damage and size before accepting delivery.
- B. Store in a protected, clean, dry area with temperature maintained above 50 degrees F. Stack according to manufacturer's recommendations.
- C. Acclimate screens to building temperatures for 24 hours prior to installation, or in accordance with manufacturer's recommendations.

1.6 WARRANTY
- A. See Section 01780 - Closeout Submittals, for additional warranty requirements.
- B. Provide 10 year manufacturer warranty for projection screen assembly.

PART 2 PRODUCTS

2.1 FRONT PROJECTION SCREENS
- A. Manufacturers:
  1. Da-Lite Screen Company; _____: www.da-lite.com.
  2. Draper, Inc (Manual); Apex: www.draperinc.com.
  3. Substitutions: See Section 01600 - Product Requirements.
- B. Front Projection Screens: Factory assembled unless otherwise indicated.
  1. In Roll Call Room: Motorized, matte light diffusing fabric screen, horizontally tensioned, wall mounted.
     a. Screen Dimensions: 108 inch high by 108 inch wide.
- C. Matte Light Diffusing Fabric: Light diffusing screen fabric; washable, flame retardant and mildew resistant.
  1. Material: Matte white vinyl on fiberglass backing, with nominal gain of 1.0 over viewing angle not less than 70 degrees from axis, horizontally and vertically.
  2. Seams: No seams permitted in fabric up to 96 inch high by 72 inch wide.
- D. Exposed Screen Cases: Steel; integral roller brackets.
  1. Finish: Baked enamel.
  2. Color: White.
  3. End Caps: Steel; finished to match case.
  4. Mounting: Wall.
     a. Use of blue (tap-con) screws is prohibited.
     b. Mechanical attachment to wall to match color of wall bracket or be stainless steel.
- E. Electrically-Operated Screens:
  1. Roller: 2 inch aluminum, with locking device.
  2. Vertical Tensioning: Screen fabric weighted at bottom with steel bar with plastic end caps.
  3. Horizontal Tensioning: Tab-guided cable system.

F. Provide mounting hardware, brackets, supports, fasteners, and other mounting accessories required for a complete installation, in accordance with manufacturer's recommendations for specified substrates and mountings.

2.2 ELECTRICAL COMPONENTS
A. Electrical Components: Listed and classified by UL as suitable for the purpose specified and indicated.
B. Motors: Direct drive, 110 V, 60 Hz.
1. Screen Motor: Mounted inside roller; three wire with ground; quick reverse type and lifetime lubricated; equipped with thermal overload cut-off, internal junction box, electric brake, and pre-set accessible limit switches.
a. Electrical Characteristics: 1.2 amps.
b. Motor mounted on sound absorber.
C. Controls: Three (3) position control switch with plate.

PART 3 EXECUTION

3.1 EXAMINATION
A. Verify that substrate is finished and ready to accept screen installation.
B. If substrate preparation is the responsibility of another installer, notify Wilder Architecture, Inc. of unsatisfactory preparation before proceeding.
C. Verify type and location of electrical connections.
D. Do not install projection screens until climate control systems are in place and interior painting and other finishes are completed.

3.2 INSTALLATION
A. Install in accordance with manufacturer's instructions, using manufacturer's recommended hardware for relevant substrates.
B. Install plumb and level.
C. Install electrically operated screens ready for connection to power and control systems by others.
D. Adjust projection screens and related hardware in accordance with manufacturer's instructions for proper placement and operation.
E. Test electrical screens for proper working condition. Adjust as needed.

3.3 PROTECTION
A. Protect installed products until completion of project.
B. Touch up, repair, or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 12305 - CASEWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Related Sections include the following:
  1. Division 6 Section "Miscellaneous Carpentry" for blocking within walls.
  2. Division 15 Section "Plumbing Fixtures" for sink units mounted in countertops.

1.2 SUMMARY
- A. This Section includes the following:
  1. Plastic-laminate-faced casework.
  2. Plastic-laminate countertops.
  3. Accessories.

1.3 DEFINITIONS
- A. Exposed Portions of Casework: Surfaces visible when doors and drawers are closed, including bottoms of cabinets more than 48 inches above floor, and visible surfaces in open cabinets or behind glass doors.
  1. Ends of cabinets, including those installed directly against walls or other cabinets, shall be considered exposed.
  2. Ends of cabinets indicated to be installed directly against and completely concealed by walls or other cabinets after installation shall not be considered exposed.
- B. Semi-exposed Portions of Casework: Surfaces behind opaque doors, such as interiors of cabinets, shelves, dividers, interiors and sides of drawers, and interior faces of doors. Tops of cases 78 inches or more above floor are defined as semi-exposed.
- C. Concealed portions of casework include sleepers, web frames, dust panels, and other surfaces not usually visible after installation.

1.4 SUBMITTALS
- A. Product Data: For the following:
  1. Cabinets.
  2. Plastic-laminate.
  3. Cabinet hardware.
- B. Shop Drawings: For cabinets and countertops. Include plans, elevations, details, and attachments to other work. Show dimensions, materials, finishes, filler panels, hardware, edge and backsplash profiles, cutouts for plumbing fixtures, anchoring devices, and methods of joining countertops.
- C. Samples for Initial Selection: Manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available for each type of material exposed to view.
- D. Samples for Verification:
  1. One full-size, finished base cabinet complete with hardware, doors, and drawers, but without countertop.
  2. One full-size, finished wall cabinet complete with hardware, doors, and adjustable shelves.
  3. Plastic laminate, 8 by 10 inches.

1.5 DELIVERY, STORAGE, AND HANDLING
- A. Do not deliver casework until painting, utility roughing-in, and similar operations that could damage, soil, or deteriorate casework have been completed in installation areas. If casework must be stored in other than installation areas, store only in areas whose environmental conditions meet requirements specified in "Project Conditions" Article below.
- B. Protect finished surfaces from soiling and damage during handling and installation. Keep covered with polyethylene film or other protective covering.

1.6 QUALITY ASSURANCE
- A. Source Limitations for Cabinets: Obtain cabinets through one source from a single manufacturer.
- B. Pre bid-coordinate field visit with architect and CM to confirm intent prior to submitting bid. CM to schedule meeting with all casework subcontractors as part of pre bid process.
- C. Product Designations: Drawings indicate size, configurations, and finish material of casework by referencing designated manufacturer's catalog numbers. Other manufacturers' casework of similar sizes, similar door and drawer configurations, same finish material, and complying with the Specifications may be considered. Refer to Division 1 Section "Substitutions."

D. Manufacturers shall submit evidence of at least five (5) years experience and installations for similar type of project. Manufacturers shall also show evidence of financial stability, plant facilities, catalogs and specifications.
   1. Full-sized samples complete with hardware, doors and adjustable shelves, catalogs and specifications, shall be submitted.
   2. Samples may be impounded by Owner and retained until completion of job for verification and compliance with the Specifications.

1.7 PROJECT CONDITIONS
   A. Environmental Limitations: Do not deliver or install casework until building is enclosed, wet-work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.
   B. Established Dimensions: Where casework is indicated to fit to other construction, establish dimensions for areas where casework is to fit. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Provide fillers and scribes to allow for trimming and fitting.
   C. Field Measurements: Where casework is indicated to fit to existing construction, verify dimensions of existing construction by field measurements before fabrication and indicate measurements on Shop Drawings. Provide fillers and scribes if necessary.
   D. Field Measurements: Verify dimensions of existing construction by field measurements before fabrication and indicate measurements on Shop Drawings.
   E. Field Measurements for Countertops: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   F. Storage and Protection:
      1. Casework shall be protected in transit.
      2. Panels shall be protected in transit.
      3. Store under cover in a ventilated building not exposed to extreme temperature and humidity changes.
      4. Do not store or install casework in building until concrete, masonry, and plaster work is dry.

1.8 COORDINATION
   A. Coordinate layout and installation of blocking and reinforcement in partitions for support of casework.

1.9 GUARANTEE
   A. General Guarantee: All materials shall be guaranteed for a period of five years from manufacturer’s defects and workmanship.

PART 2 - PRODUCTS

2.1 COLORS, TEXTURES, AND PATTERNS
   A. Colors, Textures, and Patterns: Solid color, textured finish vertical surface grade as selected by Architect from manufacturer's full range for these characteristics.
      1. Provide a minimum of 35 selections.
      2. Cabinet faces shall be one color. End panels may match face or as selected from manufacturer’s stock color selection.
      3. A total of five different colors may be selected for the project.
      4. Direction of wood grain to be vertical on door, end panels, and exposed backs; horizontal on drawer faces, aprons, and top rails.

2.2 MATERIALS
   A. General:
      1. 1" thick shelves must be used on all cabinets.
      2. Panels to be 3/4" thick with phenolic neutral colored backer sheet on a concealed side.
      3. Backs of all cabinets shall be minimum 3/8" thick particle board and let-in on at least 3 sides, or 1/4" stapled onset hardboard, or 1/4" plywood or 1/2" thick onset particle board stapled and screw attached.
      4. All edges of drawer fronts and doors shall be finished with 3 mm thick color through PVC edging. All edges and corners must be rounded to a 1/8" radius.
      5. The cabinet base must be separate from the cabinet body and must be constructed of 4" high pressure treated material.
      6. All cabinets must have a minimum 3/8" thick installation rail for mounting to the wall, except where 1/2" thick material is provided.
      7. 1" thick Wall and Tall cabinet tops and bottoms must be used on all cabinets over 36" wide unless a built-in center support divider is provided.
      8. Laminated plastic edge banding will not be acceptable.

B. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated, or if not indicated, as required by woodwork quality standard.
C. High-Pressure Plastic Laminate: .028“, for exposed surfaces shall meet GP28 standards for vertical grade.
D. Plastic Laminate Balancing Sheet: Putty, light beige, dove gray or white colored .020‘‘ high pressure plastic laminate backing sheet shall be textured surface, and meet NEMA LD3-1991 GL-20 standards, and be of type and thickness to properly balance face-finish. Color subject to Architect's selection.
E. Counter Top High Pressure Plastic Laminate: High pressure plastic laminate meeting NEMA LD3-1991 GP50 standards, satin or textured finish .050” thickness.
F. Polyester or Melamine Laminate: (Materials are used interchangeably within this specification. Either product is acceptable.)
   1. Thermal acid resistant polyester resin impregnated laminate, permanently bonded to substrate.
   2. NEMA LD 3.3-1991 GP28, and LD3-1991 CL20 requirements, standards and tests shall apply.
   3. Putty, light beige, dove gray or white colored polyester laminate or pressure fused melamine for semi-exposed cabinet interiors behind doors and drawers, and interiors of all open cabinets. Color subject to standard with manufacturer.
G. High Performance Particle Board Core:
   1. Particle board shall be 45 to 47 lb. density, and balanced construction with moisture content not to exceed 8%. All particle boards shall meet or exceed the requirements for its type and classification under ANSI A208.1-1993 Grade M-3.
   2. In addition to the above, Particle Board shall meet the following minimum Performance Requirements. Submit compliance data from the manufacturer prior to fabrication:
      a. Screw Holding, Face: 250 lbs
      b. Modulus of Rupture: 2,400 psi
      c. Modulus of Elasticity: 400,000 psi
      d. Internal Bond: 80 psi
      e. Surface Hardness: 500 lbs
H. Hardboard: Hardboard shall meet or exceed Commercial Standards CS-251 and Federal Specifications LLL-B-00810. Tempered hardboard 1/4" thick – smooth both sides.
I. Plywood: 3/4" thick plywood (with high-pressure plastic laminate) for shelves where indicated in the Drawings.
J. Edge Banding: 3 mm thick PVC solid, high impact, purified, color-thru, acid resistant, PVC edging machine-applied with hot melt adhesives, automatically trimmed for uniform appearance, buffed and corner-radiused for consistent design. Use for door/drawer edges. Color in white, putty, black, gray, or matching, as selected by Architect.

2.3 CASEWORK HARDWARE
A. General: Manufacturer's standard units complying with BHMA A156.9, of type, material, size, and finish as selected from manufacturer's standard choices.
B. Hinges: heavy duty, five knuckle, 2-3/4", overlay, hospital tip, 0.095 inch thick steel. Hinges shall have a minimum of eight (8) edge and leaf fastenings.
   1. Quantity: One pair per door to 48" height. Two pair over 48" in height.
   2. Finish: Brushed Chrome.
C. Pulls: Shall be Satin chrome 4" wire pull; Stanley #4484 or equal.
D. Sliding Door Hardware: Sliding glass doors, 1/4" thick: K & V #P1092 anodized Ezy Roll Aluminum Track Assembly with steel ball bearing rollers, or equal.
E. Drawer Slides:
   1. Standard Drawers: Shall be equal to Fulterer FR2021, KV-1429, Blum 230E Minimum 100 lb. live-load rating, with in and out stops.
   2. File and Paper Storage/Poster Drawers: Full extension, minimum 100 lb. zinc plated or epoxy coated at manufacturer’s option, equal to KV-8400, Blum 430E or Grant 329.
F. Catches/Stops:
   1. Provide 5 lb. magnetic catch for base and wall cabinets. Provide two 5 lb. magnetic catches at each tall cabinet door.
   2. At double doors provide spring loaded catches on inactive leaf. Provide metal pull chain to 5’ 0’’ A.F.F.
   3. Provide nylon rope stops where cabinet doors would otherwise hit adjacent surfaces.
G. Adjustable shelf supports: Twin-pin anti-tip with locking device to prevent accidental shelf slide-off. Load rating to be minimum of 150 lbs. each support without failure. Cabinet interior sides shall be flush, without shelf system permanent projection. Shelf clip to accommodate 3/4" and 1" shelves.

2.4 DETAILED REQUIREMENTS FOR CABINET CONSTRUCTION:
A. Sub-Base:

1. Cabinet Sub-base: To be separate and continuous (no cabinet body sides-to-floor), pressure treated 2 x 4 or pressure treated plywood with concealed fastening to cabinet bottom. Ladder-type construction, of front, back and intermediates, to form a secure and level platform to which cabinets attach. Inset 1/4 inch at cabinet finished ends for a recessed vinyl base condition.

B. Cabinet Top and Bottom - Wall and Base:
1. Base cabinet bottoms to be putty, light beige, dove gray, or white colored polyester laminated particle board interior side, 3/4" thick with phenolic neutral colored backer sheet on a concealed side.
2. At sink locations, base cabinet box to be exterior grade plywood, sides, front, rear and bottom with finish materials as specified.
3. Solid sub-top to be 3/4" and furnished for all base cabinets.
4. Wall cabinet and library stack bottoms and tops shall be 3/4" thick where less than 36" wide and 1" thick where greater than 36" wide.
5. Exterior underside of exposed wall cabinet bottoms to be polyester laminate. Assembly devices to be concealed on bottom side of wall cabinets.
6. Exposed body edges including the top of Wall and Tall cabinets shall be 1 mm Flat Edge in color to match 3 mm edging.

C. Cabinet Tops - Wall and Tall Cabinets:
1. Tops of Wall and Tall cabinets to be edge banded with 1 mm Flat edge PVC. Tops to be covered with polyester laminate.

D. Cabinet Ends:
1. Putty, light beige, dove gray, or white colored polyester laminated particle board interior side, 3/4" thick with phenolic neutral colored back sheet on concealed side. Holes drilled for adjustable shelves 1-1/4" on center.
2. To properly anchor hinges, provide full-height solid wood, covered with plastic laminate, at all tall cabinets scheduled to receive doors.
3. Exposed exterior cabinet ends to be laminated with plastic laminate.
4. Exposed edges to be 1 mm Flat edge in color to match 3 mm edging.

E. Fixed and Adjustable Shelves:
1. Putty, light beige, dove gray, or white colored polyester laminated particle board two sides. Leading exposed edge of shelves shall be edged with 1 mm Flat Edge PVC, putty, black or gray in color.
2. Thickness: standard shelving to be 3/4" thick. Provide 1" thick shelving where 30" wide and over. Provide 1'' thick shelving at all open cabinets regardless of width.
3. Instrument storage shelves to be 3/4" thick consisting of 1/8" tempered hardboard laminated to top and bottom of 1/2" particle board core. Front leading edge rabbeted to receive 3/4" x 3/4" extruded metal edge.
4. Library stack shelving to be 1" thick.

F. Cabinet Backs:
1. Standard cabinet back to be 3/8" thick let in on at least 3 sides, prefinished putty, light beige, dove gray or white for use on all cabinets with or without doors. Rear, unexposed, side of back to receive continuous hot melt glue at joint between back and sides/top/bottom/ for sealing against moisture and vermin, and further contribute to case rigidity, or 1/4" stapled onset hardboard, or 1/2" stapled and screwed onset particle board.
2. Exposed exterior backs to be 3/4" particle board faced with high pressure plastic laminate and balanced with .020'' high pressure cabinet liner.

G. Doors and Drawer Fronts:
1. Plastic laminated doors and drawer fronts to be 13/16" thick for all hinged and sliding doors. Core materials to be 3/4" thick (1'' thick at doors over 48'' high) minimum, 45 lb. density particle board bonded on exterior with high pressure laminate and with putty, light beige, dove gray or white .020'' high pressure cabinet liner balancing sheet on interior face. Drawer fronts and hinged doors are to overlay the cabinet body. Maintain a maximum 1/8" reveal between pairs of doors, between door and drawer front, or between multiple drawer fronts within the cabinet.
2. Exposed edges to be 3 mm thick PVC, color as selected by Architect. Corners and both edges to be machine-radiused and buffed to a consistent 3 mm radius.
3. Stile and Rail doors to be 13/16" thick plastic laminate door with 1/4" plate glass. Available hinged or sliding. All exposed lite-opening edges to be trimmed and glazed with extruded vinyl glazing bead.
4. Sliding glass doors to be 1/4" thick tempered plate glass with ground and polished edges. Fitted with etched and anodized aluminum shoes and nylon rollers.
5. Provide door stops/holders where necessary to prevent door from opening into adjacent cabinets, mirrors, etc.

H. Drawers:
1. Drawer fronts shall be applied to separate drawer body component sub-front.

2. Sides and back of drawers to be 1/2" thick putty, light beige, dove gray or white colored fiberboard conforming to ANSI A 208.2; sub-front same, to be 5/8" thick.
3. Fiberboard to be of uniform density and meet the following minimum standards:
   a. Screw Holding, Face: 320 lbs.
   b. Screw Holding, Edge: 230 lbs.
   c. Modulus of Rupture: 4,500 psi
   d. Modulus of Elasticity: 500,000 psi
   e. Internal Bond: 100 psi
4. Exposed top edge to be 1 mm Flat Edge PVC, White or Putty in color.
5. Drawer sides shall be dadoed or rabbeted to receive front and back, glued, machine squared and held under pressure while pinned together.
6. Drawer bottom to be polyester laminate, 1/4" thick tempered hardboard, housed and glued into front, sides and back with underside of drawer to receive continuous hot melt glue at joint between bottom and back/sides/front for sealing and rigidity, or 1/2" thick prefinished particle board with color to be putty, light beige, dove gray, or white screwed directly to the bottom edges of the drawer box. Reinforce drawer bottoms as required with intermediate spreaders, 1 at 24'', 2 at 36'' and 4 at 48'' width.
7. Paper storage drawers fitted with full width hood at back.
8. All drawers shall have roller guides as specified.

I. Vertical and Horizontal Dividers:
1. Tempered hardboard 1/4" thick, smooth both faces. Secured in cabinet with molded plastic clips.
2. Putty, light beige, dove gray or white colored polyester laminated particle board 3/4" thickness. Secured in cabinet with molded plastic clips or dowels. Front edge to be 1 mm Flat Edge PVC.

J. Door/Drawer Spreaders:
1. Provide 1" x 2" minimum x full width putty, light beige, dove gray or white finished cabinet body spreaders immediately behind all door/drawer and multiple drawer horizontal joints to maintain exact body dimensions, and close off reveal. Front edge shall be matching laminate or 1 mm Flat Edge PVC, as per Architect's selection.

K. Countertops:
1. High pressure plastic laminate bonded to particle board core. Thickness as shown on plans and specifications. Underside to be properly balanced with heavy gauge backing sheet. Edges to be high pressure plastic laminate to match horizontal surface color. Furnish countertops in design as shown on drawings. Provide continuous tops for counter type cabinets fixed in a line.
2. At all sink locations, provide high pressure plastic laminate bonded to exterior grade plywood. Thickness as shown on plans and specifications.

L. Workmanship:
1. All exposed exterior cabinet surfaces to be GP28 decorative high pressure plastic laminate, color as selected from casework manufacturer's standards, minimum 35 colors/wood grains available. Laminate surface/backer to core under controlled conditions, by approved and regulated laminating methods to assure a premium lamination.
2. Cabinet parts, shall be accurately machined and bored for premium quality grade joinery construction utilizing automatic machinery to ensure consistent sizing of modular components.
3. Sides, top and bottom may be fastened securely with dowel construction or "Mod-Eez" joint structural fastening system. "Mod-Eez" clips shall be placed in strategic points throughout the cabinet insuring absolute rigid cabinet joinery. Top of base cabinet and between top drawers shall consist of wood frame fastened to the body with "Mod-Eez" system clips. When using ''Mod-Eez" method, seal interior perimeter with clear silicone sealant after cabinet placement.
4. End panels shall be doweled to receive bottom and top. Back panel shall be fully secured into cabinet sides, top and bottom to insure rigidity and fully closed cabinet.
5. Drawer bottom shall be fully housed into sides, back and subfront. Sides of drawer shall be fully dadoed or rabbeted to receive drawer back, locked in fully to subfront, fastened with glue and mechanical fasteners, or as specified herein.
6. 3/8" thick minimum hang rails shall be applied to back of all wall, base and tall cabinets for extra rigidity and to facilitate installation and contribute to cabinet structure.
7. Rear of cabinet back and underside of drawer bottom joints to receive a continuous bead of hot melt adhesive to add to unit body strength and develop moisture seal, where specified herein.
8. All cases shall be square, plumb and true.
9. Provide removable back panels and closure panels for plumbing access where shown on Architectural and/or Plumbing Drawings.
10. Provide filler panels at sides and tops. Scribe fillers to wall and secure to adjacent cabinet. Seal casework fillers to adjacent wall.

PART 3 - EXECUTION

3.1 EXAMINATION
- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of reinforcement, and other conditions affecting performance of wood laboratory casework installation.
- B. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of reinforcement, and other conditions affecting performance of panel installation.
  1. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 COORDINATION:
- A. Coordinate work of this Section with related work of other Sections as necessary to obtain proper installation of all items.
- B. Verify site dimensions of cabinet locations in building prior to fabrication.

3.3 CASEWORK INSTALLATION
- A. Install plumb, level, and true; shim as required, using concealed shims. Where casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.
- B. Base Cabinets: Set cabinets straight, plumb, and level. Adjust subtops within 1/16 inch of a single plane. Fasten cabinets to partition framing, wood blocking, or reinforcements in partitions with fasteners spaced 24 inches o.c. Bolt adjacent cabinets together with joints flush, tight, and uniform. Align similar adjoining doors and drawers to a tolerance of 1/16 inch.
  1. Where base cabinets are not installed adjacent to walls, fasten to floor at toe space with fasteners spaced 24 inches o.c. Secure sides of cabinets to floor, where they do not adjoin other cabinets, with not less than 2 fasteners.
- C. Wall Cabinets: Hang cabinets straight, plumb, and level. Adjust fronts and bottoms within 1/16 inch of a single plane. Fasten to hanging strips, masonry, partition framing, blocking, or reinforcements in partitions. Fasten each cabinet through back, near top, at not less than 24 inches o.c. Align similar adjoining doors to a tolerance of 1/16 inch.
- D. Install casework with no variations in flushness of adjoining surfaces; use concealed shims. Where casework abuts other finished work, scribe and cut for accurate fit. Provide filler strips, scribe strips, and moldings in finish to match casework face.
  1. Do not install casework over carpet.
- E. Workmen: Install casework under the supervision of the manufacturer’s representative with factory-trained mechanics authorized by manufacturer.
- F. Workmanship:
  1. Erect casework straight, level and plumb and securely anchor in place. Scribe and closely fit to adjacent work. Cut and fit work around pipes, ducts, etc.
  2. Install all items complete and adjust all moving parts to operate properly.
  3. Leave surface clean and free from defects at time of final acceptance.
  4. Wall cabinets shall be supported by sufficient and adequate fasteners. Adequate blocking shall be attached to the studding system or masonry wall before the wall is finished. Cabinets shall be attached to the wall using a minimum of one fastener at top and bottom for each 12 inches of length (i.e., minimum 4 fasteners per 12" width, 2 top and 2 bottom.) The use of plastic anchors is strictly prohibited. Attach to wall using tapcons or lead shields and screws.

3.4 PANEL INSTALLATION
- A. Install plumb, level, and true; shim as required, using concealed shims.
- B. Hang panels straight, plumb, and level.
- C. Workmen: Install casework under the supervision of the manufacturer’s representative with factory-trained mechanics authorized by manufacturer.
- D. Workmanship:
  1. Erect panels straight, level and plumb and securely anchor in place.
  2. Leave surface clean and free from defects at time of final acceptance.

3.5 INSTALLATION OF COUNTERTOPS
- A. Field Jointing: Where possible, make in the same manner as shop jointing using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project site processing of top and edge surfaces is not required. Locate field joints where shown on approved Shop Drawings.
- B. Fastenings: Except for epoxy and phenolic-composite tops, use concealed clamping devices for field joints located within 6 inches of front, at back edges, and at intervals not exceeding 24 inches. Tighten according to manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.

1. Secure tops, to cabinets with Z-type fasteners or equivalent, using 2 or more fasteners at each front, end, and back.

C. Abut top and edge surfaces in one true plane, with internal supports placed to prevent deflection. Provide flush hairline joints in tops using clamping devices.
   1. Where necessary to penetrate tops with fasteners, countersink heads approximately 1/8 inch and plug hole flush with material equal to top in chemical resistance, hardness, and appearance.

D. Provide required holes and cutouts for service fittings.
E. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
F. Provide scribe moldings for closures at junctures of top, curb, and splash, with walls as recommended by manufacturer for materials involved. Match materials and finish to adjacent casework. Use chemical-resistant, permanently elastic sealing compound where recommended by manufacturer.

3.6 INSTALLATION OF ACCESSORIES

A. Install accessories according to approved Shop Drawings and manufacturer's written instructions.
B. Securely fasten adjustable shelving supports, stainless-steel shelves, and pegboards to partition framing, wood blocking, or reinforcements in partitions.
C. Install shelf standards plumb and at heights to align shelf brackets for level shelves. Install shelving level and straight, closely fitted to other work where indicated.

3.7 ADJUSTING AND CLEANING

A. Clean-Up: Remove all cartons, debris, sawdust, scraps, etc., and leave spaces clean and all casework clean inside and out and ready for Owner’s use.
B. Adjust casework and hardware so doors and drawers are centered in openings and operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.
C. Clean casework on exposed and semiexposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

END OF SECTION

SECTION 12493 - VERTICAL LOUVER BLINDS

PART 1 GENERAL

1.1 SECTION INCLUDES
- A. Vertical louver blinds at all exterior windows.

1.2 RELATED REQUIREMENTS
- A. Section 06100 - Rough Carpentry: Concealed wood blocking for attachment of headrail brackets.

1.3 REFERENCE STANDARDS
- A. WCMA A100.1 - Safety of Corded Window Covering Products; Window Covering Manufacturers Association. (ANSI/WCMA A101.1)
- B. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; National Fire Protection Association.

1.4 SUBMITTALS
- A. See Section 01300 - Administrative Requirements, for submittal procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
  1. Preparation instructions and recommendations.
  2. Storage and handling requirements and recommendations.
  3. Installation methods.
- C. Certification: Provide certification that product complies with WCMA A100.1.
- D. Verification Samples: For vanes, minimum size 6 inches square, representing actual materials, color and perforations.

1.5 QUALITY ASSURANCE
- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING
- A. If blinds are delivered early and stored at the project, deliver in unopened containers; handle and store in such a manner to protect them from damage.

PART 2 PRODUCTS

2.1 MANUFACTURERS
- A. Vertical Louver Blinds:
  1. Levolor Contract; Model _____: www.levolorcontract.com.

2.2 BLINDS AND BLIND COMPONENTS
- A. Vertical Louver Blinds: Horizontal travel, vertical louver units complete with tracks, pivot and traversing mechanisms, and accessories, as follows:
  1. Louvers: PVC louver blades of the size indicated.
  2. Operation: Manual.
  3. Direction of Travel: Bi-parting.
  4. Mounting: Outside (face of jambs).
  5. Cord and Chain Operation: Comply with WCMA A100.1.
- B. Tracks: Channel tracks as required for type of operation, extruded aluminum with clear anodized finish, with end caps.
  1. Dimensions: Manufacturer's standard, selected for suitability for installation conditions, span, and weight of louvers.
  2. Louver Rotation: Chain driven direct rotation by activating tilt gear within end cap assembly in turn actuating tilt rod and worm-and-spur gears in carrier trucks.
  3. Operating Components: Internally mounted heavy-duty extruded aluminum tilt rod, louver carriers, and other components required for proper performance and designed for smooth, quiet, trouble free operation.
  4. Pivot Mechanism: Geared for synchronous 180 degrees rotation of louver blades and type of operation indicated.
  5. Louver Carriers: Metal carriers with ball-bearing wheels or thermoplastic trucks, equipped with linkages or other devices to ensure positive spacing of louver blades.
  6. Tilt Chain: Nickel plated brass beaded ball chain, minimum 1/8 inch diameter; locate at drawback side of units as indicated.
- C. PVC Vanes: Integrally colored, extruded PVC; flat, 2 inches (50mm) wide.

1. Thickness: 0.030 inch, minimum.
2. Flammability: Comply with NFPA 701.
3. Color: White.
4. Texture: Smooth.

D. Brackets and Mounting Hardware: As recommended by manufacturer for the mounting configuration and span indicated; provide manufacturer's standard L- bracket with clip for outside mounting and clip only for inside mounting.

2.3 FABRICATION

A. Field measure finished openings prior to ordering or fabrication.
B. Fabricate blinds to fit openings within specified tolerances.
   1. Vertical Dimensions: Fill openings from head to sill with 1/2 inch space between bottom of vanes and finish floor.
C. Dimensional Tolerances: Fabricate blinds to within plus/minus 1/8 inch of intended dimensions.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not start installation before openings are finished and all finishes have been completed; do not install until painting is completed.
B. Field measure finished openings prior to ordering or fabrication.

3.2 PREPARATION

A. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
B. Coordinate the work with window installation and placement of concealed blocking to support blinds.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions using mounting style as indicated.
B. Installation Tolerances:
   1. Maximum Offset From Level: 1/16 inch.
C. Adjust blinds for smooth operation.
D. Replace blinds that exceed specified dimensional tolerances at no extra cost to Hillsborough County Sheriff's Office.

3.4 CLEANING

A. Clean installed work to like-new condition.

3.5 PROTECTION

A. Protect installed products until completion of project.
B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

APPENDIX ONE
Submittal Checklist

SUBMITTAL CHECKLIST

The Submittal Checklist provided is provided as a checklist and shall not take precedence over the actual section of the specifications. When Product Data is requested the Contractor is to provide Material Safety Data Sheets as well.

SECTION 01320 - CONSTRUCTION PROGRESS DOCUMENTATION
☐ Submittals Schedule
☐ Preliminary Construction Schedule
☐ Preliminary Network Diagram
☐ Contractor's Construction Schedule
☐ CPM Reports
☐ Field Condition Reports
☐ Special Reports

SECTION 01600 - PRODUCT REQUIREMENTS
☐ Product List

SECTION 01731 - CUTTING AND PATCHING
☐ Cutting and Patching Proposal

SECTION 01732 – DUST CONTROL
☐ Proposed Dust Control and Noise Control Measures
☐ Inventory of Salvaged Items
☐ Predemolition Videotape
☐ Contractor's Construction Schedule

SECTION 06100 - ROUGH CARPENTRY
☐ Product Data

SECTION 07210 - BUILDING INSULATION
☐ Product Data for each type of insulation product specified.
☐ Samples of exposed insulation.
☐ Product test reports.

SECTION 07841 - THROUGH-PENETRATION FIRESTOP SYSTEMS
☐ Product Data
☐ Products Certificates.

SECTION 07900 - JOINT SEALERS
☐ Product Data

SECTION 08110 - STEEL DOORS AND FRAMES
☐ Product Data
☐ Shop Drawings.
☐ Door Schedule
☐ Oversize Construction Certificates

SECTION 08211 - FLUSH WOOD DOORS
☐ Product Data
☐ Shop Drawings

SECTION 08800 – GLAZING
☐ Product Data: For each glass product and glazing material indicated.
☐ Samples: for each glass specified.
☐ Glazing Schedule.
☐ Product Certificates.
☐ Qualification Data: For installers.

☐ Preconstruction Adhesion and Compatibility Test Report:
☐ Product Test Reports: For each type of glazing product:
☐ Warranties.

SECTION 09260 - GYPSUM BOARD ASSEMBLIES
☐ Product Data

SECTION 09511 - ACOUSTICAL PANEL CEILINGS
☐ Product Data.
☐ Warranty

SECTION 09651 - RESILIENT FLOOR TILE, BASE AND ACCESSORIES
☐ Product Data
☐ Samples for Initial Selection
☐ Product Certificates
☐ Maintenance Data

SECTION 09680 – CARPET
☐ Product Data
☐ Samples for Initial Selection
☐ Installer Certificates
☐ Material Certificates
☐ Maintenance Data

SECTION 09912 – PAINTING
☐ Product Data
☐ Samples for Initial Selection
☐ Samples for Verification

SECTION 10431 – SIGNS
☐ Product Data
☐ Shop Drawings
☐ Samples for Initial Selection
☐ Samples for Verification

SECTION 10520 - FIRE-PROTECTION SPECIALTIES
☐ Product Data.
☐ Samples for Initial Selection
☐ Maintenance Data
☐ Special Warranty

SECTION 10950 - MISCELLANEOUS SPECIALTIES
☐ Submit product data, shop drawings and samples as required under each specialty item scheduled

SECTION 12305 – CASEWORK
☐ Product Data
☐ Shop Drawings
☐ Samples for Initial Selection
☐ Samples for Verification

SECTION 15010 - MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Work herein shall conform to all applicable laws, ordinances, and to regulations of the local utility companies. The general conditions and all requirements of the contract documents shall apply to all work of this section. Work shall be in accordance with the requirements of:
   1. State of Florida, Department of Insurance, Division of State Fire Marshal - Uniform Fire Safety Rules and Regulations (Florida Statute 633).
   2. 2011 National Electrical Code
   3. Florida Building Code (FBC) 5th Edition (2014): This code includes The 2014 FBC Building, Mechanical, Plumbing, Fuel Gas and Energy Conservation Volumes. Further, see “Referenced Standards” in the FBC, Building Chapter 35; FBC, Plumbing Chapter 14; FBC, Mechanical Chapter 15; FBC, Fuel Gas Chapter 8, FBC, Energy Conservation Chapter 5.) (Effective June 30, 2015)
   4. 5th Edition of the Florida Fire Prevention Code (FFPC): (This code also includes the Florida versions of NFPA 1 and NFPA 101.) (Effective December 31, 2014)
   5. State of Florida, Department of Environmental Regulation Rules
   6. Local Utility Codes

B. Use only mechanics skilled in the work they are to perform and have a competent representative on the job when any work is being done.

C. No work shall be done unless the Superintendent of the Contractor is on the job site. Work shall be properly protected, all rubbish removed promptly, and exposed work shall be carefully cleaned prior to final acceptance.

D. The term "provide" shall include labor, materials, and equipment necessary to furnish and install, complete and operable, the item or system indicated.

E. In decisions arising from discrepancies, interpretation of Drawings and Specifications, substitutes, and other pertinent matters, the decision of the Owner's representative's approval shall be final.

1.2 SPECIFICATIONS AND DRAWINGS

A. Plans show location of fixtures and equipment and are intended to depict the general intent of the work in scope, layout and quality of workmanship. They are not intended to show in minute detail every or all accessories intended for the purpose of executing the work, but it is understood that such details are a part of this work.

B. Where Drawings and Specifications conflict, it shall be the responsibility of this Contractor to bring such conflict to the attention of the Architect/Engineer for clarification. In general, the Architectural Drawings shall take precedence over the Mechanical Drawings with reference to building construction. All changes from the Drawings necessary to make the work conform with the building as constructed and to fit the work of other trades or to conform to the rules of authorities having jurisdiction, shall be made by the Contractor at his own expense.

C. Keep a record of the locations of concealed work and of any field changes in Contract Drawings and Specifications for each trade and, upon completion of the job, supply "As-Built" Drawings and Specifications showing in pencil on sepia reproducibles, any deviations from the original Drawings, indicating in the Specifications each manufacturer's name underlined or inserted whose product was used on the job. These Drawings shall indicate dimensions of buried utility lines from building walls. One set of sepia reproducibles of the original tracings will be furnished upon request for this purpose.

D. Where equipment is used other than manufacturers specified, the Sub-Contractor shall request approval to substitute materials and/or products as indicated and defined herein. Provide four (4) copies of materials and equipment for approval, for items requiring submittals.

1.3 PERMITS, FEES AND INSPECTIONS:

A. The Contractor shall give all necessary notices, obtain all permits and pay all government fees, sales taxes and other costs, including utility connections or extensions, in connection with this work; file all permit applications required by all governmental departments having jurisdiction.

B. Obtain all required certificates of inspection for work and deliver them to the Owner before requesting acceptance and final payment for the work.

C. The Contractor shall include in the work, without extra cost to the Owner, any labor, materials, services, apparatus and drawings required to comply with all applicable laws, ordinances, rules and regulations.

D. The Contractor shall inform the Owner of any work or materials which conflict with any of the applicable codes, standards, laws and regulations before submitting his bid.

1.4 GENERAL

A. Materials or products specified herein and/or indicated on drawings by trade name, manufacturer's name and/or catalog number shall be provided as specified. Substitutions will not be permitted except as described herein and in the Supplementary and General Conditions.
B. Since manufacturers reserve the right to change their products at any time, contractors shall verify all dimensions, performance data, etc. for each piece of equipment submitted to assure compliance with the intent of the drawings and specifications.
C. All materials shall be new and of quality as specified, and when required, be clearly labeled and/or stamped as manufactured in the United States.
D. For acceptance of products or manufacturers other than those specified, bidders shall submit to the Architect/Engineer a request in writing at least ten (10) days prior to bid date and hour. Requests received after this time will not be reviewed or considered regardless of cause. Requests shall clearly define and describe the product for which approval is requested. Requests shall be accompanied by manufacturer's literature, specifications, drawings, cuts, performance data list of references or other information necessary to completely describe the item. Approval will be in the form of an addendum to the specifications issued to all prospective prime contract bidders on record. The addendum will indicate the additional products which are approved for this project.
E. A list of all materials and equipment which the Contractor proposes to furnish shall be submitted for approval within ten (10) days after the contract has been awarded. Data shall be complete in all respects.
F. Where an accepted substitution or deviation requires different quantity or arrangement of foundations, supports, ductwork, piping, wiring, conduit, and any other equipment or accessories normal to this equipment, contractor shall furnish said changes and additions and pay all costs for all changes and additions to his work and the work of others affected by this substitution or deviation.
G. Deviations mean the use of any listed approved manufacturer other than those on which the drawings are based.

1.5 SHOP AND ERECTION DRAWINGS AND SAMPLES

A. The Architect/Engineer's approval shall be obtained for all equipment and material before delivery to the job site. Delivery, storage or installation of equipment or material which has not had prior approval will not be permitted at the job site. Submittals shall be made for all equipment and systems as indicated in the respective specification section.
B. All submittals shall include adequate descriptive literature, catalog cuts, shop drawings and other data necessary for the Architect/Engineer to ascertain that the proposed equipment and materials comply with specification and drawing requirements. Catalog cuts submitted for approval shall be legible and clearly identify equipment being submitted.
C. Shop and erection drawing submittals shall conform to the requirements of the General Conditions and Division-1 specifications except as modified herein.
D. Submit required and/or requested shop and erection drawings, for review by Architect/Engineer before ordering or installing any equipment or material. Equipment or material ordered or installed before Architect/Engineer review may not be accepted and may have to be removed from the project if deemed unacceptable.
E. Shop drawings shall consist of manufacturer's scale drawings, cuts or catalogs, including descriptive literature which shall clearly indicate the construction, material, physical dimensions, wiring diagrams and complete operating data clearly marked for each item. Data of general nature will not be accepted.
F. Shop drawings on paper larger than 11”x17” shall be submitted in the form of one set of reproducibles (vellum) and one set of blueprints. The blueprints will be retained by the engineer and the reproducibles will be returned to the contractor. All drawings are to be submitted no later than 60 days after the contract has been awarded.
    1. Coordination drawings shall show major elements, components, and systems of mechanical equipment and materials in relationship with other building components. Prepare drawings to an accurate scale of 1/4"=1'-0" or larger. Indicate the locations of all equipment and materials, including clearances for installing, servicing and maintaining equipment, valve stem movement, and similar requirements. Indicate movement and positioning of large equipment into the building during construction.
G. Submittals for individual systems and equipment assemblies which consist of more than one item or component shall be made for the system or assembly as a whole. Partial submittals will not be considered for approval. Submittals shall be submitted for all applicable products and materials specified in each individual section of these specifications.
H. Make submittals for the equipment and materials in accordance with the following:
    1. Mark the submittals, "SUBMITTED UNDER SECTION_____".
    2. Submittals shall be marked to show specification reference including the section and paragraph numbers.
    3. The submittals shall include the following:

a. Information that confirms compliance with contract requirements. Include the manufacturer's name, model or catalog numbers, catalog information, technical data sheets, shop drawings, pictures, nameplate data and test reports as required. Provide any additional information specifically requested in the individual specification section or on the drawings.
b. Parts list which shall include those replacement parts recommended by the equipment manufacturer, quantity of parts, current price and availability of each part.

I. Shop drawings on paper 11”X17” or smaller in size shall be submitted in tabbed and indexed three ring binder. The binder shall not exceed 11-5/8” height. Partial submittals are unacceptable. The index shall indicate the related specification section number.
J. A Fee will be charged for Engineering review of drawings received after the time allotted as described in “F” above or for plans that have been rejected two or more times due to non-compliance or incompleteness. The fee will be determined by the Architect/Engineer and will accompany the re-submittal in the form of a cashiers check or money order made payable to the Engineer.
K. The General Contractor will certify that all electrical shop drawings are in conformance with the plans and specifications. Deviations from the plans and specifications shall be noted, and the specific area of the deviation clouded and in contrasting color (green) with a complete explanation for the reasons for the deviation. Any redesign of the system shall be Certified by a Professional Engineer currently registered in the State of Florida, and will be accompanied by the fees as described in “J” above.
L. Carefully examine all shop drawings and mark-up as necessary before submitting to the Architect/Engineer for review. The consultant will only consider shop drawings bearing the contractor’s stamp of approval.
M. The engineer’s review shall not relieve the contractor from the responsibility for deviations from drawings and specifications. The engineer’s review shall be construed to apply only to general arrangement and shall not relieve the contractor from the responsibility for the correctness of details and dimensions and provision of the correct equipment.
N. The contractor shall retain copies of all reviewed shop drawings on the job site for reference.
O. In addition to the requirement of SUBMITTALS, the Owner reserves the right to request the manufacturer to arrange for the Owner's representative(s) to see typical active systems in operation, when there has been no prior experience with the manufacturer or the type of equipment being submitted.

1.6 COORDINATION WITH OTHER TRADES
A. Contractor shall coordinate his work with other trades to avoid interferences and delays. He shall assist in working out space requirements to make a satisfactory installation.
B. If the Contractor installs his work before coordinating with other trades, or so as to cause any interference with the work of other trades, he shall make the necessary changes in his work to correct the condition without extra charge.
C. The Contractor shall furnish to other trades, as required, all necessary templates, patterns, setting plans, and shop details for the proper installation of work and for the purpose of coordinating adjacent work.

1.7 EQUIPMENT IDENTIFICATION
A. Each unit shall be identified by its system number and other appropriate designation by stenciling in letters of approved size and wording. Equipment requiring identification shall include: supply and exhaust fans, air conditioning and heating machinery and apparatus, control cabinets, and other equipment units as may be directed by the owner.

1.8 CUTTING, PATCHING, EXCAVATION, BACKFILL, AND LAYOUT
A. Provide openings and excavation required for the installation of the work. Patch work and backfill as required. Finished work shall match the existing adjoining work.
B. Verify all conditions affecting the work to be performed under this contract.
C. Carefully verify measurements at the site, determine the exact location of chases and openings required. Provide sleeves, inserts, and hangers as required. No columns, beams, joists, building foundations nor any other structural building component shall be cut, drilled or disturbed in any way. Conflicts shall immediately be brought to the attention of the Architect/Engineer.
D. All excavation on sites containing existing buildings and existing services, shall be done with hand shovel to avoid damage to existing services. Any damage incurred by the Contractor shall be repaired by the Contractor in a manner approved by the Architect/Engineer at no cost to the Owner and with no extension of time limitation.

1.9 EXPERIENCE
A. The Contractor performing this work shall be a licensed, reputable firm, regularly performing the type of work incorporated in this project and who also maintains, as part of the firm, a service department with qualified personnel who regularly perform this type of work. The Contractor shall, upon request, show evidence of at least two jobs of similar character and size installed within the preceding two years.

1.10 ELECTRICAL WORK FOR MECHANICAL SYSTEMS

A. Controllers, and control equipment necessary for mechanical equipment operation shall be provided under Division 15 Mechanical. Starters not integral with mechanical equipment and starters mounted in motor control centers shall be provided under Division 16 Electrical.
B. Power wiring for motors and installation of starters shall be provided under Division 16 Electrical.
C. Temperature, humidity, pressure and similar controls essential to the operation of mechanical systems, and wiring and conduit thereof, including interlock wiring, shall be provided under Division 15 of Specifications, installed in accordance with requirements of Division 16.
D. Motors shall be provided under Division 15 Mechanical of capacity required to operate equipment specified, but shall not be less than that specified.
E. All low voltage (120V and under) temperature control wiring for equipment shall be provided under this division.
F. Conduit when required for control wiring shall be provided under this division.

1.11 MOTORS

A. All motors shall be furnished and installed under Division 15 Mechanical and shall be wired under Division 16 Electrical.
B. All motors shall be built in accordance with the current applicable IEEE, ASA, and NEMA standards. All general purpose motors shall be open drip-proof machines for installation indoors and/or in protected locations. Totally enclosed fan cooled (TEFC) motors shall be used in all areas of exposure to weather or other environmental contamination. Motors shall be rated explosion proof when located in hazardous atmospheres. Type II weather protected motors may be used in lieu of TEFC motors on roof mounted fan units and similar equipment.
C. Unless indicated otherwise, motors shall be NEMA Design B with a service factor of 1.15 with total temperature rise of 90 degrees C. (resistance measured) in 40 degrees C. ambient when powered from the system voltage feeding the motor. TEFC motors shall have a service factor of 1.00 with total temperature rise of 80 degrees C. in the above conditions. Motors located in areas exceeding 40 degrees C. ambient shall be factory rated for the ambient temperature of the motor environment. Single phase motors shall generally be NEMA Design N split phase induction motors with built-in thermal protectors. Single phase motors connected on loads requiring high starting torque shall be capacitor-start induction motors. Single phase motors of 1/10 HP or less may be shaded pole induction motors.
D. If the Contractor proposes to furnish motors varying in horsepower and/or characteristics from those specified, he shall first inform the Architect/Engineer of the change and shall then coordinate the change and shall pay all additional charges in connection with the change.
E. All motors supplied on this project one (1) HP and larger shall have a power factor not less than 85 percent under rated load conditions. Power factor of less than 85 percent shall be corrected to at least 90 percent under rated load conditions. Power factor corrective devices, installed to comply with this Code, shall be switched with the utilization equipment.

1.12 REMOVAL OF RUBBISH

A. Contractor shall keep premises free from accumulations of waste material or rubbish caused by his employees or work. At completion of work, he shall remove all his tools, scaffolding, surplus materials, and rubbish from building and site. He shall leave premises and his work in a clean orderly condition acceptable to the Architect/Engineer.

1.13 QUIET OPERATION AND VIBRATION

A. All equipment provided under this section shall operate under all conditions of load free of objectionable sound and vibration. Sound and vibration conditions considered objectionable shall be corrected in an approved manner.
B. Vibration and sound control shall be by means of approved vibration eliminators or sound attenuators in a manner as specified and as recommended by the manufacturer.

1.14 EXAMINATION OF EXISTING CONDITIONS

A. Visit and carefully examine those portions of the site and/or present buildings affected by this work so as to become familiar with existing conditions and difficulties that will affect the execution of the work before submitting proposals.
B. Submission of a proposal will be construed as evidence that such examination has been made and later claims for labor, equipment or materials required because of difficulties encountered, which could have been foreseen had such examination been made, will not be recognized.

1.15 CLEANING AND ADJUSTMENTS
- A. Upon completion of work, Contractor shall clean and lubricate fans, motors, and other running equipment and apparatus which he has installed and make certain such apparatus and mechanisms are in proper working order and ready to test.
- B. Scratched or damaged painting shall be touched up as necessary to return the painting to "new" condition and appearance.
- C. All piping and equipment shall be thoroughly blown out under pressure and cleared of all foreign matter, wasting air, gas or water through temporary connections as long as necessary to thoroughly clean system before system is placed in operation. Use every precaution to prevent pipe compound, scale, dirt, welding and other objectionable matter from getting into the piping system and equipment.
- D. All cleaning shall be done prior to any sterilization, pressure testing, flow balancing or equipment adjustment procedures.

1.16 CLEANING AND PROTECTING
- A. During construction protect all piping and equipment from damage and dirt. Cap the open ends of all piping and equipment.
- B. After completion of project clean the exterior surface of equipment included in this section, remove all concrete residues and as directed touch up paint or completely repaint all damaged surfaces.

1.17 STORAGE OF MATERIALS
- A. All materials stored on site shall be properly protected from injury or deterioration. Materials shall not be stored in contact with ground or floor.
- B. Do not remove manufacturer's packing materials until ready to install. Materials showing signs of corrosion, improper handling or storage shall be replaced at no cost to the Owner.
- C. Provide continuous protection for all equipment already installed.

1.18 WATERPROOFING
- A. Where any work pierces waterproofing including waterproof concrete, the method of installation shall be as approved by the Owner before the work is done.
- B. Provide all necessary sleeves, caulking and flashing required to make openings absolutely watertight. Waterproof flashing materials shall be compatible with base materials.

1.19 TESTS
- A. Contractor shall make all tests required to establish the adequacy, quality, safety, completed status and satisfactory operation of all systems to the satisfaction of the Architect/Engineer. Provide all instruments, labor and services necessary to conduct tests.

1.20 INSTRUCTIONS
- A. Fully instruct Owner's personnel in the care and operation of mechanical systems and furnish a letter to the Architect/Engineer advising the particular person who has received such instruction.

1.21 GUARANTEE
- A. Equipment shall be started, tested, adjusted, and placed in satisfactory operating condition. Furnish a letter addressed to the Architect/Engineer advising that the completed systems have been installed in accordance with the Plans and Specifications and that they are in proper operating condition. The Owner shall receive a written guarantee covering all defects in workmanship and material for a period of one year from date of final acceptance. Any defects appearing within this year period shall be repaired without additional cost to the Owner.

1.22 ACCEPTANCE
- A. Before requesting final inspection:
  1. Complete all work required. If any items are held in abeyance as incomplete for final inspection, list such items together with explanation for delay.
  2. Submit statement that equipment is properly installed, adjusted, fully lubricated and operation is satisfactory.
  3. Certify in writing to the Architect/Engineer that the Owner's representative has been instructed as to the care and operation of the system and that catalog service and maintenance information has been turned over to the Architect/Engineer.
  4. Submit copy of written guarantee.
  5. Submit copy of other data as may be outlined in these specifications.
- B. Copies of the above data shall be submitted to the Architect/Engineer prior to requesting final inspection.

1.23 BROCHURE
- A. At the completion of work, Sub-Contractor shall submit a bound brochure containing the following:

1. Shop Drawings
2. Maintenance Manuals
3. Control Wiring and Piping Diagrams
4. Operating Instructions
5. Copy of Guarantee
6. As-Built Drawings

B. Where projects are of sufficient size to make a single brochure impractical, several brochures shall be prepared by trade and As-Built Drawings may be submitted as a separate item.
C. Brochure shall be indexed and divided for reasonable clarity.
D. Brochure shall be turned over to the Architect/Engineer for review and approval. The contractor shall make modifications to the brochure as deemed necessary for compliance and clarity, by the Architect/Engineer, and re-submit the final brochure to the Architect/Engineer to be forwarded to the Owner.

END OF SECTION

SECTION 15060 – DOMESTIC WATER PIPING AND PIPE FITTINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:
- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 00 Specification sections, apply to work of this section.
- B. This section is a Division 15 Basic Mechanical Materials and Methods section, and is part of each Division 15 section making reference to pipes and pipe fittings specified herein.

1.2 DESCRIPTION OF WORK:
- A. Extent of pipes and pipe fittings required by this section is indicated on drawings and/or specified in other Division 15 sections.
- B. Type of pipes and pipe fittings specified in this section include the following:
  1. Steel Pipes.
  2. Copper Tube.
  3. Cast-Iron Soil Pipes.
  4. Plastic Pipes.
  5. Miscellaneous Piping Materials/Products.
- C. Pipes and pipe fittings furnished as part of factory-fabricated equipment, are specified as part of equipment assembly in other Division 15 sections.

1.3 QUALITY ASSURANCE:
- A. Manufacturer's Qualifications: Firms regularly engaged in manufacturer of pipes and pipe fittings of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

1.4 Codes and Standards:
- A. Welding: Qualify welding procedures, welders and operators in accordance with ASME B31.1, or ASME B31.9, as applicable, for shop and project site welding of piping work.
  1. Certify welding of piping work using Standard Procedure Specifications by, and welders tested under supervision of, National Certified Pipe Welding Bureau (NCPWB).
- B. Brazing: Certify brazing procedures, brazers, and operators in accordance with ASME Boiler and Pressure Vessel Code, Section IX, for shop and job-site brazing of piping work.
- C. NSF Labels: Where plastic piping is indicated to transport potable water, provide pipes and pipe fittings bearing approval label by National Sanitation Foundation (NSF).

1.5 SUBMITTALS:
- A. Product Data: Submit manufacturer's technical product data, installation instructions, and dimensioned drawings for each type of pipe and pipe fitting. Submit piping schedule showing manufacturer, pipe or tube weight, fitting type, and joint type for each piping system.
- B. Welding Certifications: Submit reports as required for piping work.
- C. Brazing Certifications: Submit reports as required for piping work.
- D. Maintenance Data: Submit maintenance data and parts lists for each type of mechanical fitting. Include this data, product data, and certifications in maintenance manual; in accordance with requirements of Division 00.

1.6 DELIVERY, STORAGE, AND HANDLING:
- A. Provide factory-applied plastic end-caps on each length of pipe and tube. Maintain end-caps through shipping, storage and handling as required to prevent pipe-end damage and eliminate dirt and moisture from inside of pipe and tube.
- B. Where possible, store pipe and tube inside and protected from weather. Where necessary to store outside, elevate above grade and enclose with durable, waterproof wrapping.
- C. Protect flanges and fittings from moisture and dirt by inside storage and enclosure, or by packaging with durable, waterproof wrapping.

PART 2 - PRODUCTS

2.1 GENERAL:
- A. Piping Materials: Provide pipe and tube of type, joint type, grade, size and weight (wall thickness or Class) indicated for each service. Where type, grade or class is not indicated, provide proper selection as determined by Installer for installation requirements, and comply with governing regulations and industry standards.

B. Pipe/Tube Fittings: Provide factory-fabricated fittings of type, materials, grade, class and pressure rating indicated for each service and pipe size. Provide sizes and types matching pipe, tube, valve or equipment connection in each case. Where not otherwise indicated, comply with governing regulations and industry standards for selections, and with pipe manufacturer's recommendations where applicable.

2.2 STEEL PIPES AND PIPE FITTINGS:
A. Black Steel Pipe: ASTM A53, A106 or A120; except comply with ASTM A53 or A106 where close coiling or bending is required.
B. Malleable-Iron Threaded Fittings: ANSI B16.3.
C. Malleable-Iron Threaded Unions: ANSI B16.39; selected by Installer for proper piping fabrication and service requirements, including style, end connections, and metal-to-metal seats (iron, bronze or brass).
D. Threaded Pipe Plugs: ANSI B16.14.
E. Steel Flanges/Fittings: ANSI B16.5, including bolting and gasketing of the following material group, end connection and facing, except as otherwise indicated.
1. Material Group: Group 1.1.
2. End Connections: Buttwelding.
3. Facings: Raised-face.
F. Wrought-Steel Buttwelding Fittings: ANSI B16.9, except ANSI B16.28 for short-radius elbows and returns; rated to match connected pipe.
G. Pipe Nipples: Fabricated from same pipe as used for connected pipe; except do not use less than Schedule 80 pipe where length remaining unthreaded is less than 1-1/2", and where pipe size is less than 1-1/2", and do not thread nipples full length (no close-nipples).

2.3 COPPER TUBE AND FITTINGS:
A. Copper Tube: ASTM B88; type (wall thickness) as indicated for each service; hard-drawn temper, except as otherwise indicated.
B. Cast-Copper Solder-Joint Fittings: ANSI B16.18.
C. Wrought-Copper Solder-Joint Fittings: ANSI B16.22.
D. Copper-Tube Unions: Provide standard products recommended by manufacturer for use in service indicated.

2.4 PLASTIC PIPES AND PIPE FITTINGS:
A. Polyvinyl Chloride Pipe (PVC): ASTM D1785.
B. Polyvinyl Chloride Drain, Waste, and Vent Pipe (PVC): ASTM D2665.
C. Chlorinated Polyvinyl Chloride Pipe (CPVC): ASTM F441.
D. PVC Fittings:
1. Schedule 40 Socket: ASTM D2466.
2. Schedule 80 Socket: ASTM D2467.
3. Schedule 80 Threaded: ASTM D2464.
4. DWV Socket: ASTM D2665.
5. Sewer Socket: ASTM D2729.
6. Solvent Cement: ASTM D2564.
7. Solvent Cement (To Join PVC to ABS): ASTM D3138.

2.5 GROOVED PIPING PRODUCTS:
A. General: As Installer's option, mechanical grooved pipe couplings and fittings may be used for piping systems in mechanical equipment rooms having operating conditions not exceeding 230°F (110°C), excluding steam piping and any other service not recommended by manufacturer, in lieu of welded, flanged, or threaded methods, and may also be used as unions, seismic joints, flexible connections, expansion joints, expansion compensators, or vibration reducers.
B. Coupling Housings: Malleable iron conforming to ASTM A47 or ductile iron conforming to ASTM A536.
C. Coupling Housings Description: Grooved mechanical type, which engages grooved or shouldered pipe ends, encasing an elastomeric gasket which bridges pipe ends to create seal. Cast in two or more parts, secure together during assembly with nuts and bolts. Permit degree of contraction and expansion as specified in manufacturer's latest published literature.
D. Gaskets: Mechanical grooved coupling design, pressure responsive so that internal pressure serves to increase seal's tightness, constructed of elastomers having properties as designated by ASTM D2000.
E. Bolts and Nuts: Heat-treated carbon steel, ASTM A183, minimum tensile 110,000 psi.
F. Branch Stub-Ins: Upper housing with full locating collar for rigid positioning engaging machine-cut hole in pipe, encasing elastomeric gasket conforming to pipe outside diameter around hole, and lower housing with positioning lugs, secured together during assembly with nuts and bolts.
G. Fittings: Grooved or shouldered end design to accept grooved mechanical couplings.
H. Malleable Iron: ASTM A47.

I. Ductile Iron: ASTM A536.
J. Fabricated Steel: ASTM A53, Type F for 3/4" to 1-1/2"; Type E or S, Grade B for 2" to 20".
K. Steel: ASTM A234.
L. Flanges: Conform to Class 125 cast iron and Class 150 steel bolt hole alignment.
M. Malleable Iron: ASTM A47.
N. Ductile Iron: ASTM A536.
O. Grooves: Conform to the following:
   1. Standard Steel: Square cut.
P. Manufacturer: Subject to compliance with requirements, provide grooved piping products of one of the following:
   1. ITT Grinnell Corp.
   2. Stockham Valves & Fittings, Inc.
   3. Victaulic Co. of America.

2.6 MISCELLANEOUS PIPING MATERIALS/PRODUCTS:
A. Welding Materials: Except as otherwise indicated, provide welding materials as determined by Installer to comply with installation requirements.
B. Comply with Section II, Part C, ASME Boiler and Pressure Vessel Code for welding materials.
C. Soldering Materials: Except as otherwise indicated, provide soldering materials as determined by Installer to comply with installation requirements.
D. Tin-Antimony Solder: ASTM B32, Grade 95TA.
E. Gaskets for Flanged Joints: ANSI B16.21; full-faces for cast-iron flanges; raised-face for steel flanges, unless otherwise indicated.
F. Piping Connectors for Dissimilar Non-Pressure Pipe: Elastomeric annular ring insert, or elastomeric flexible coupling secured at each end with stainless steel clamps, sized for exact fit to pipe ends and subject to approval by plumbing code.
G. Manufacturer: Subject to compliance with requirements, provide piping connectors of the following:
   1. Fernco, Inc.

PART 3 - EXECUTION

3.1 INSTALLATION:
A. General: Install pipes and pipe fittings in accordance with recognized industry practices which will achieve permanently-leak proof piping systems, capable of performing each indicated service without piping failure. Install each run with minimum joints and couplings, but with adequate and accessible unions for disassembly and maintenance/replacement of valves and equipment. Reduce sizes (where indicated) by use of reducing fittings. Align piping accurately at connections, within 1/16" misalignment tolerance.
B. Comply with ANSI B31 Code for Pressure Piping.
C. Locate piping runs, except as otherwise indicated, vertically and horizontally (pitched to drain) and avoid diagonal runs wherever possible. Orient horizontal runs parallel with walls and column lines. Locate runs as shown or described by diagrams, details and notations or, if not otherwise indicated, run piping in shortest route which does not obstruct usable space or block access for servicing building and its equipment. Hold piping close to walls, overhead construction, columns and other structural and permanent-enclosure elements of building; limit clearance to 1/2" where furring is shown for enclosure or concealment of piping, but allow for insulation thickness, if any. Where possible, locate insulated piping for 1" clearance outside insulation. Wherever possible in finished and occupied spaces, conceal piping from view, by locating in column enclosures, in hollow wall construction or above suspended ceilings; do not encase horizontal runs in solid partitions, except as indicated.
D. Electrical Equipment Spaces: Do not run piping through transformer vaults and other electrical or electronic equipment spaces and enclosures.

3.2 PIPING SYSTEM JOINTS:
A. General: Provide joints of type indicated in each piping system.
B. Thread pipe in accordance with ANSI B2.1; cut threads full and clean using sharp dies. Ream threaded ends to remove burrs and restore full inside diameter. Apply pipe joint compound, or pipe joint tape (Teflon) where recommended by pipe/fitting manufacturer, on male threads at each joint and tighten joint to leave not more than 3 threads exposed.
C. Solder copper tube-and fitting joints where indicated, in accordance with recognized industry practice. Cut tube ends squarely, ream to full inside diameter, and clean outside of tube ends and inside of fittings. Apply solder flux to joint areas of both tubes and fittings. Insert tube full depth into fitting, and solder in manner which will draw solder full depth and circumference of joint. Wipe excess solder from joint before it hardens.
D. Weld pipe joints in accordance with ASME Code for Pressure Piping, B31.
E. Weld pipe joints only when ambient temperature is above 0°F (-18°C) where possible.

F. Bevel pipe ends at a 37.5° angle where possible, smooth rough cuts, and clean to remove slag, metal particles and dirt.
G. Use pipe clamps or tack-weld joints with 1" long welds; 4 welds for pipe sizes to 10", 8 welds for pipe sizes l2" to 20".
H. Build up welds with stringer-bead bass, followed by hot pass, followed by cover or filler pass. Eliminate valleys at center and edges of each weld. Weld by procedures which will ensure elimination of unsound or unfused metal, cracks, oxidation, blow-holes and non-metallic inclusions.
I. Do not weld-out piping system imperfections by tack-welding procedures; refabricate to comply with requirements.
J. Flanged Joints: Match flanges within piping system, and at connections with valves and equipment. Clean flange faces and install gaskets. Tighten bolts to provide uniform compression of gaskets.
K. Plastic Pipe/Tube Joints: Comply with manufacturer's instructions and recommendations, and with applicable industry standards.
L. Making Solvent-Cemented Joints: ASTM D2235, and ASTM F402.
M. Grooved Pipe Joints: Comply with fitting manufacturer's instructions for making grooves in pipe ends. Remove burrs and ream pipe ends. Assemble joints in accordance with manufacturer's instructions.

3.3 CLEANING, FLUSHING, INSPECTING:
A. General: Clean exterior surfaces of installed piping systems of superfluous materials, and prepare for application of specified coatings (if any). Flush out piping systems with clean water before proceeding with required tests. Inspect each run of each system for completion of joints, supports and accessory items.
B. Inspect pressure piping in accordance with procedures of ASME B31.
C. Disinfect water service piping in accordance with AWWA C601.

3.4 PIPING TESTS:
A. Test pressure piping in accordance with ASME B31.
B. General: Provide temporary equipment for testing, including pump and gages. Test piping system before insulation is installed wherever feasible, and remove control devices before testing. Test each natural section of each piping system independently but do not use piping system valves to isolate sections where test pressure exceeds valve pressure rating. Fill each section with water and pressurize for indicated pressure and time.
C. Required test period is 48 hours.
D. Test each piping system at 150% of operating pressure indicated, but not less than 25 psi test pressure.
E. Observe each test section for leakage at end of test period. Test fails if leakage is observed or if pressure drop exceeds 5% of test pressure.
F. Repair piping systems sections which fail required piping test, by disassembly and re-installation, using new materials to extent required to overcome leakage. Do not use chemicals, stop-leak compounds, mastics, or other temporary repair methods.
G. Drain test water from piping systems after testing and repair work has been completed.

END OF SECTION

SECTION 15100 – VALVES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:
- A. Drawings and general provisions of Contract, including General Conditions and Division 00 Specification sections, apply to work of this section.
- B. This section is a Division 15 Basic Mechanical Materials and Methods section, and is part of each Division 15 section making reference to valves specified herein.

1.2 DESCRIPTION OF WORK:
- A. Extent of valves required by this section is indicated on drawings and/or specified in other Division 15 sections.
- B. Types of valves specified in this section include the following:
  1. Gate Valves.
  2. Drain Valves.
  3. Ball Valves.
  4. Butterfly Valves.
  5. Swing Check Valves.
- C. Valves furnished as part of factory-fabricated equipment, are specified as part of equipment in other Division 15 sections.

1.3 QUALITY ASSURANCE:
- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of valves, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Valve Types: Provide valves of same type by same manufacturer.
- C. Valve Identification: Provide valves with manufacturer's name (or trademark) and pressure rating clearly marked on valve body.
- D. Codes and Standards:
- E. MSS Compliance: Mark valves in accordance with MSS-25 "Standard Marking System for Valves, Fittings, Flanges and Unions".
- F. ANSI Compliance: For face-to-face and end-to-end dimensions of flanged- or welded-end valve bodies, comply with ANSI B16.10 "Face-to-Face and End-to-End Dimensions of Ferrous Valves".

1.4 SUBMITTALS:
- A. Product Data: Submit manufacturer's technical product data, including installation instructions for each type of valve. Include pressure drop curve or chart for each type and size of valve. Submit valve schedule showing manufacturer's figure number, size, location, and valve features for each required valve.
- B. Shop Drawings: Submit manufacturer's assembly-type (exploded view) shop drawings for each type of valve, indicating dimensions, weights, materials, and methods of assembly of components.

PART 2 - PRODUCTS

2.1 VALVES:
- A. General: Provide factory-fabricated valves recommended by manufacturer for use in service indicated. Provide valves of types and pressure ratings indicated; provide proper selection as determined by Installer to comply with installation requirements. Provide end connections which properly mate with pipe, tube, and equipment connections. Where more than one type is indicated, selection is Installer's option.
- B. Sizes: Unless otherwise indicated, provide valves of same size as upstream pipe size.
- C. Operators: Provide handwheels, fastened to valve stem, for valves other than quarter-turn. Provide lever handle for quarter-turn valves, 6" and smaller.

2.2 GATE VALVES:
- A. Comply with the following standards:
  1. Cast-Iron Valves: MSS SP-70.
  2. Bronze Valves: MSS SP-80.
  3. Steel Valves: ANSI B16.34.
- B. Manufacturer: Subject to compliance with requirements, provide gate valves of one of the following:
  1. Crane Co.
  2. Fairbanks Co.
  3. Hammond Valve Corp.
  4. ITT Grinnell Valve Co., Inc.

5. Jenkins Bros.
6. Lunkenheimer Co.
7. Milwaukee Valve Co., Inc.
8. Nibco, Inc.
9. Powell (Wm) Co.
10. Stockham Valves and Fittings.
11. Walworth Co.

2.3 DRAIN VALVES:

A. Comply with the following standards:
   1. Water Heater Drain Valves: ASSE 1005.

B. Manufacturer: Subject to compliance with requirements, provide globe valves of one of the following:
   1. Hammond Valve Corp.
   2. Lee Brothers; Div. Phelps Dodge Brass Co.
   3. Mansfield Plumbing Products.
   4. Nibco Inc.
   5. Prier Brass Mfg. Co.
   6. Tanner Mfg. Co.

2.4 BALL VALVES:

A. Comply with the following standards:
   1. Cast-Iron Valves: MSS SP-72.
   2. Steel Valves: ANSI B16.34.

B. Manufacturer: Subject to compliance with requirements, provide ball valves of one of the following:
   1. Conbraco Industries, Inc.
   2. Crane Co.
   3. Fairbanks Co.
   4. Hammond Valve Corp.
   5. ITT Grinnell Valve Co., Inc.
   6. Jamesbury Corp.
   7. Jenkins Bros.
   8. Metraflex Co.
   9. Nibco, Inc.
   10. Powell (The Wm.) Co.
   11. Stockham Valves and Fittings, Inc.
   12. Walworth Co.
   13. Watts Regulator Co.

2.5 BUTTERFLY VALVES:

A. General: Comply with MSS SP-67. Provide lug-body type valves for all applications.

B. Manufacturer: Subject to compliance with requirements, provide butterfly valves of one of the following:
   1. Center Line; Mark Controls Corp.
   2. Crane Co.
   3. Demco; Div. Cooper Industries, Inc.
   4. Fairbanks Co.
   5. ITT Grinnell Valve Co., Inc.
   6. Jamesbury Corp.
   7. Jenkins Bros.
   8. Keystone Valve USA.
   9. Nibco, Inc.
   10. Powell (The Wm.) Co.
   11. Stockham Valves and Fittings.

2.6 SWING CHECK VALVES:

A. Comply with the following standards:
   1. Cast-Iron Valves: MSS SP-71.
   2. Bronze Valves: MSS SP-80
   3. Steel Valves: ANSI B16.34.

B. Manufacturer: Subject to compliance with requirements, provide swing check valves of one of the following:
   1. Crane Co.
   2. Fairbanks Co.
   3. Hammond Valve Corp.
   4. Jenkins Bros.

5. Lunkenheimer Co.
6. Milwaukee Valve Co., Inc.
7. Nibco, Inc.
8. Powell (The Wm.) Co.
9. Stockham Valves and Fittings
10. TITAN
11. Walworth Co.

2.7 VALVE FEATURES:

A. General: Provide valves with features indicated and, where not indicated otherwise, provide proper valve features as determined by Installer for installation requirements. Comply with ASME B31.9 for building services piping, and ASME B31.1 for power piping.
B. Flanged: Valve flanges complying with ANSI B16.1 (cast iron), ANSI B16.5, (steel), or ANSI B16.24 (bronze).
C. Threaded: Valve ends complying with ANSI B2.1.
D. Socket-Welding: Valve ends complying with ANSI B16.11.
E. Solder-Joint: Valve ends comply with ANSI B16.18.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Except as otherwise indicated, comply with the following requirements:
   1. Install valve where required for proper operation of piping and equipment, including valves in branch lines where necessary to isolate sections of piping. Locate valves so as to be accessible and so that separate support can be provided when necessary.
   2. Install valves with stems pointed up, in vertical position where possible, but in no case with stems pointed downward from horizontal plane unless unavoidable. Install valve drains with hose-end adapter for each valve that must be installed with stem below horizontal plane.
B. Insulation: Where insulation is indicated, install extended-stem valves, arranged in proper manner to receive insulation.
C. Mechanical Actuators: Install mechanical actuators with chain operators where indicated. Extend chains to about 5' above floor and hook to clips to clear aisle passage.
D. Selection of Valve Ends (Pipe Connections): Except as otherwise indicated, select and install valves with the following ends or types of pipe/tube connections:
   1. Tube Size 2" and Smaller: Soldered-joint valves.
   2. Pipe Size 2" and Smaller: One of the following, at Installer's option:
      a. Threaded valves.
      b. Butt-welding valves
      c. Socket-welding valves.
      d. Flanged valves.
   3. Pipe Size 2 1/2" and Larger: One of the following, at Installer's option.
      a. Grooved-end valves.
      b. Butt-welding valves.
      c. Socket-welding valves.
      d. Flanged valves.
E. Valve System: Select and install valves with outside screw and yoke stems, except provide inside screw non-rising stem valves where headroom prevents full opening of OS&Y valves.
F. Non-Metallic Disc: Limit selection and installation of valves with non-metallic discs to locations indicated and where foreign material in piping system can be expected to prevent tight shutoff of metal seated valves.
G. Renewable Seats: Select and install valves with renewable seats, except where otherwise indicated.
H. Fluid Control: Except as otherwise indicated, install gate, ball, and butterfly valves to comply with ANSI B31.9. Where throttling is indicated or recognized as principal reason for valve, install butterfly valves, unless indicated otherwise on the plans.

3.2 INSTALLATION OF CHECK VALVES:

A. Swing Check Valves: Install in horizontal position with hinge pin horizontally perpendicular to center line of pipe. Install for proper direction of flow.

3.3 ADJUSTING AND CLEANING:

A. Valve Adjustment: After piping systems have been tested and put into service, but before final testing, adjusting, and balancing, inspect each valve for possible leaks. Adjust or replace packing to stop leaks, replace valve if leak persists.
B. Valve Identification: Tag each valve in accordance with Division 15 section "Mechanical Identification".

C. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

3.4 VALVE SCHEDULE:

A. General: Provide the following valves for various valve types listed in Division 15 piping sections.

3.5 GATE VALVES:

A. 2" and Smaller: Class 125, bronze, screw-in bonnet, rising stem, solid wedge.

	Threaded Ends	Solder Ends
Crane:	428	1334
Fairbanks:	0252	0282
Grinnell:	3010	3010-SJ
Hammond:	IB640	IB635
Jenkins:	47	1242
Lunkenheimer:	2127	2132
Milwaukee:	148	1149
Nibco:	T-111	S-111
Powell:	500-S	1821-S
Stockham:	B-100	B-108
Walworth:	55	55-SJ

C. 2" and Smaller: Class 125, bronze, screw-in bonnet, non-rising stem, solid wedge.

	Threaded Ends	Solder Ends
Crane:	438	1324
Fairbanks:	0250	0280
Grinnell:	3000	3000-SJ
Hammond:	IB645	IB647
Jenkins:	370	1240
Lunkenheimer:	2129	2133
Milwaukee:	105	1145
Nibco:	T-113	S-113
Powell:	507	1822
Stockham:	B-103	B-104
Walworth:	55	4-SJ

D. 2 1/2" and Larger: Flanged ends, class 125, iron body, bolted bonnet, solid wedge, bronze mounted.

	OS&Y	Non-Rising Stem
Crane:	4651/2	461
Fairbanks:	0405	0403
Grinnell:	6020	6060
Hammond:	IR1140	IR1138
Jenkins:	651A	326
Lunkenheimer:	1430	1428
Milwaukee:	F-2885	F-2882
Nibco:	617-O	F-619
Powell:	1793	1787
Stockham:	G0623	G-612
Walworth:	8726-F	8719-F

E. Hose End, 2 1/2": FM, 174 psi, bronze body, solid wedge, inside screw, non-rising stem. Provide cap and chain.

Fairbanks:	0210.
Jenkins:	707.
Lunkenheimer:	366.
Nibco:	T-103-HC.
Walworth:	115.

F. Threaded End; 2" and Smaller: FM, UL-listed, 175 psi, bronze body, solid wedge, outside screw and yoke, rising stem.

Crane:	459.
Fairbanks:	0222.
Hammond:	IB681.
Jenkins:	175U.

Nibco:	T-104-O.
Stockham:	B-133.
Walworth:	904.

G. Flanged End; 2 1/2" and Larger: FM, UL-Listed, 175 psi, iron body bronze mounted, solid wedge, outside screw and yoke, rising stem.

Crane:	467.
Fairbanks:	0412.
Hammond:	IR1154.
Jenkins:	825-A.
Nibco:	F-607-O.
Stockham:	G-634.
Walworth:	8713-F.

3.6 DRAIN VALVES:

A. Class 125: Bronze body, screw-in bonnet, rising stem, composition disc, 3/4" hose outlet.

	Threaded Ends	Solder Ends
Hammond:	712	711
Lee:	717-20	717-12
Mansfield:	526.40	526.41
Nibco:	73	72
Prier:	C-73ST	C-71ST
Tanner:	806	851

3.7 BALL VALVES:

A. 1" and Smaller: 150 psi, bronze body, standard port, bronze trim, 2-piece construction, TFE seats and seals.

	Threaded Ends	Solder Ends
Conbraco:	70	70
Crane:	2182	2182
Grinnell:	3700	3700-SJ
Jamesbury:	21-1100	-
Jenkins:	900T	902T
Metraflex:	IT	IS
Nibco:	T-585	S-585
Powell:	4520R20	421OR
Stockham:	S-216BRRT	S-216BRRS
Watts:	B-6000	B-6001

A. 1 1/4" to 2": 150 psi, bronze body, standard port, 3-piece body, TFE seats with bronze trim.

	Threaded Ends	Solder Ends
Conbraco:	82	82
Fairbanks:	0851	-
Nibco:	T-595-Y	S-959-Y
Powell:	4201-R	4201-R
Watts:	B-6800	B-6801

3.8 BUTTERFLY VALVES:

A. 6" and Smaller: 150 psi, cast-iron body, extended neck, aluminum bronze disc, reinforced resilient EDPM seat, manual lever and lock.

	Lug
CenterLine:	SeriesLT
Crane:	14
Demco:	SeriesCE
Fairbanks:	3502
Grinnell:	WC-LC-8211
Hammond:	33824
Jamesbury:	8815L
Keystone:	10
Nibco:	WL-NL-082-3
Powell:	Series5000
Stockham:	LD-711-BS3E

Grooved Ends: Victaulic Series 700.

B. 8" and Larger: 150 psi, cast-iron body, extended neck, aluminum bronze disc, reinforced resilient EDPM seat, gear operator.

	Lug
CenterLine:	SeriesLT
Crane:	14
Demco:	SeriesCE
Fairbanks:	602
Grinnell:	LC-8212
Keystone:	122
Nibco:	NL-082-5
Powell:	Series5000
Stockham:	LD-721-BS3E

Grooved Ends: Victaulic Series 701.

3.9 SWING CHECK VALVES:

A. 2" and Smaller: Class 125, bronze body, horizontal swing, regrinding type, Y-pattern, renewable disc.

	Threaded Ends	Solder Ends
Crane:	37	1342
Fairbanks:	0640	0680
Grinnell:	3300	3300-SJ
Jenkins:	92-A	1222
Lunkenheimer:	2144	2145
Milwaukee:	509	1509
Nibco:	T-413	S-413
Powell:	578	1825
Stockham:	B-319	B-309
Walworth:	340600	3406-SJ

B. 2 1/2" and Larger: Class 125, iron body, bolted bonnet, horizontal swing, renewable seat and disc, flanged ends.

Crane:	373.
Fairbanks:	0702.
Grinnell:	6300.
Hammond:	IE1124.
Jenkins:	624.
Lunkenheimer:	1790.
Milwaukee:	F2971.
Nibco:	F-918.
Powell:	559.
Stockham:	G-931.
Walworth:	8928-F.

C. 2 1/2" and Larger; FM: 175 psi, iron body bronze mounted, renewable composition disc and bronze seat ring, bolted cover, flanged ends.

Fairbanks:	0711.
Jenkins:	729.
Nibco:	F-908-W.
Stockham:	G-940.
Walworth:	8883-LT.

END OF SECTION

SECTION 15120 – DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 00 Specification sections, apply to work of this section.
- B. This section is a Division 15 Basic Mechanical Materials and Methods section, and is part of each Division 15 section making reference to piping specialties specified herein.

1.2 DESCRIPTION OF WORK
- A. Extent of piping specialties work required by this section is indicated on drawings and schedules and by requirements of this section.
- B. Types of piping specialties specified in this section include the following:
  1. Pipe Escutcheons
  2. Pipeline Strainers
  3. Vandal-Proof Vent Caps
  4. Dielectric Unions
  5. Mechanical Sleeve Seals
  6. Fire Barrier Penetration Seals
  7. Water Hammer Arresters
  8. Drip Pans
  9. Pipe Sleeves
  10. Sleeve Seals
- C. Piping specialties furnished as part of factory-fabricated equipment, are specified as part of equipment assembly in other Division 15 sections.

1.3 QUALITY ASSURANCE
- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of piping specialties of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

1.4 Codes and Standards:
- A. FCI Compliance: Test and rate "Y" type strainers in accordance with FCI 73-1 "Pressure Rating Standard for "Y" Type Strainers". Test and rate other type strainers in accordance with FCI 78-1 "Pressure Rating Standard for Pipeline Strainers Other than "Y" Type".

1.5 SUBMITTALS
- A. Product Data: Submit manufacturer's technical product data, including installation instructions, and dimensioned drawings for each type of manufactured piping specialty. Include pressure drop curve or chart for each type and size of pipeline strainer. Submit schedule showing manufacturer's figure number, size, location, and features for each required piping specialty.
- B. Shop Drawings: Submit for fabricated specialties, indicating details of fabrication, materials, and method of support.
- C. Maintenance Data: Submit maintenance data and spare parts lists for each type of manufactured piping specialty. Include this data, product data, and shop drawings in maintenance manual; in accordance with requirements of Division 00.

PART 2 - PRODUCTS

2.1 PIPING SPECIALTIES
- A. General: Provide factory-fabricated piping specialties recommended by manufacturer for use in service indicated. Provide piping specialties of types and pressure ratings indicated for each service, or if not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes as indicated, and connections, which properly mate with pipe, tube, and equipment connections. Where more than one type is indicated, selection is Installer's option.

2.2 PIPE ESCUTCHEONS
- A. General: Provide pipe escutcheons as specified herein with inside diameter closely fitting pipe outside diameter, or outside the pipe insulation where pipe is insulated. Select outside diameter of escutcheon to completely cover pipe penetration hole in floors, walls, or ceilings; and pipe sleeve extension, if any. Furnish pipe escutcheons with nickel or chrome finish for occupied areas, prime paint finish for unoccupied areas.
- B. Pipe Escutcheons for Moist Areas: For waterproof floors, and areas where water and condensation can be expected to accumulate, provide cast brass or sheet brass escutcheons, solid or split hinged.

C. Pipe Escutcheons for Dry Areas: Provide sheet steel escutcheons, solid or split hinged.
D. Manufacturer: Subject to compliance with requirements, provide pipe escutcheons of one of the following:
   1. Chicago Specialty Mfg. Co.
   2. Producers Specialty & Mfg. Corp.
   3. Sanitary-Dash Mfg. Co.

2.3 LOW PRESSURE Y-TYPE PIPELINE STRAINERS:
A. General: Provide strainers full line size of connecting piping, with ends matching piping system materials. Select strainers for 125 psi working pressure, with Type 304 stainless steel screens with 3/64" perforations @ 233 per sq.in.
   1. Threaded Ends, 2" and Smaller: Cast-iron body, screwed screen retainer with centered blowdown fitted with pipe plug.
   2. Threaded Ends, 2-1/2" and Larger: Cast-iron body, bolted screen retainer with off-center blowdown fitted with pipe plug.
   3. Flanged Ends, 2-1/2" and Larger: Cast-iron body, bolted screen retainer with off-center blowdown fitted with pipe plug.
   4. Butt Welded Ends, 2-1/2" and Larger: Schedule 40 cast carbon steel body, bolted screen retainer with off-center blowdown fitted with pipe plug.
   5. Grooved Ends, 2-1/2" and Larger: Tee pattern, ductile-iron or malleable-iron body and access end cap, access coupling with EDPM gasket.
B. Manufacturer: Subject to compliance with requirements, provide low pressure Y-type strainers of one of the following:
   1. Armstrong Machine Works.
   2. Hoffman Specialty ITT; Fluid Handling Div.
   3. Metraflex Co.
   4. R-P&C Valve; Div. White Consolidated Industries, Inc.
   5. Spirax Sarco.
   6. Trane Co.
   7. Victaulic Co. of America.
   8. Watts Regulator Co.

2.4 DIELECTRIC UNIONS
A. General: Provide standard products recommended by manufacturer for use in service indicated, which effectively isolate ferrous from non-ferrous piping (electrical conductance), prevent galvanic action, and stop corrosion.
B. Manufacturer: Subject to compliance with requirements, provide dielectric unions of one of the following:
   1. B & K Industries, Inc.
   2. Capital Mfg. Co.; Div. of Harsco Corp.
   3. Eclipse, Inc.
   4. Epco Sales, Inc.
   5. Perfection Corp.
   6. Rockford-Eclipse Div.

2.5 MECHANICAL SLEEVE SEALS
A. General: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve, connected with bolts and pressure plates which cause rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.
B. Manufacturer: Subject to compliance with requirements, provide mechanical sleeve seals of one of the following:
   1. Thunderline Corp.

2.6 FIRE BARRIER PENETRATION SEALS
A. Provide seals for any opening through fire-rated walls, floors, or ceilings used as passage for mechanical components such as piping or duct work.
B. Cracks, Voids, or Holes Up to 4" Diameter: Use putty or caulking, one-piece intumescent elastomer, non-corrosive to metal, compatible with synthetic cable jackets, and capable of expanding 10 time when exposed to flame or heat, UL-listed.
C. Openings 4" or Greater: Use sealing system capable of passing 3-hour fire test in accordance with ASTM E-814, consisting of wall wrap or liner, partitions, and end caps capable of expanding when exposed to temperatures of 250 to 350^{o}F (121 to 177^{o}C), UL-listed.
D. Manufacturer: Subject to compliance with requirements, provide fire barrier penetration seals of one of the following:
   1. Electro Products Div./3M.

2. Nelson; Unit of General Signal.

2.7 WATER HAMMER ARRESTERS:
A. General: Provide bellows type water hammer arresters, stainless steel casing and bellows, pressure rated for 250 psi, tested and certified in accordance with PDI Standard WH-201.
B. Manufacturer: Subject to compliance with requirements, provide water hammer arresters of one of the following:
1. Amtrol, Inc.
2. Smith (Jay R.) Mfg. Co.
3. Tyler Pipe; Sub. of Tyler Corp.
4. Zurn Industries, Inc.; Hydromechanics Div.

2.8 FABRICATED PIPING SPECIALTIES:
A. Drip Pans: Provide drip pans fabricated from corrosion-resistant sheet metal with watertight joints, and with edges turned up 2-1/2". Reinforce top, either by structural angles or by rolling top over 1/4" steel rod. Provide hole, gasket, and flange at low point for watertight joint and 1" drain line connection.
B. Pipe Sleeves: Provide pipe sleeves of one of the following:
1. Sheet Metal: Fabricate from galvanized sheet metal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricated from the following gages: 3" and smaller, 20 gage; 4" to 6" 16 gage; over 6", 14 gage.
2. Steel-Pipe: Fabricate from Schedule 40 galvanized steel pipe; remove burrs.
3. Iron-Pipe: Fabricate from cast-iron or ductile-iron pipe; remove burrs.
4. Plastic-Pipe: Fabricate from Schedule 80 PVC plastic pipe; remove burrs.
C. Sleeve Seals: Provide sleeve seals for sleeves located in foundation walls below grade, or in exterior walls, of one of the following:
1. Lead and Oakum: Caulked between sleeve and pipe.
2. Mechanical Sleeve Seals: Installed between sleeve and pipe.

PART 3 - EXECUTION

3.1 INSTALLATION OF PIPING SPECIALTIES
A. Pipe Escutcheons: Install pipe escutcheons on each pipe penetration thru floors, walls, partitions, and ceilings where penetration is exposed to view; and on exterior of building. Secure escutcheon to pipe or insulation so escutcheon covers penetration hole, and is flush with adjoining surface.
B. Y-Type Strainers: Install Y-type strainers full size of pipeline, in accordance with manufacturer's installation instructions. Install pipe nipple and shutoff valve in strainer blow down connection, full size of connection, except for strainers 2" and smaller installed ahead of control valves feeding individual terminals. Where indicated, provide drain line from shutoff valve to plumbing drain, full size of blow down connection.
1. Locate Y-type strainers in supply line ahead of the following equipment, and elsewhere as indicated, if integral strainer is not included in equipment:
a. Pumps
b. Temperature control valves
c. Pressure reducing valves
d. Temperature or pressure regulating valves
C. Dielectric Unions: Install at each piping joint between ferrous and non-ferrous piping. Comply with manufacturer's installation instructions.
D. Mechanical Sleeve Seals: Loosely assemble rubber links around pipe with bolts and pressure plates located under each bolt head and nut. Push into sleeve and center. Tighten bolts until links have expanded to form watertight seal.
E. Fire Barrier Penetration Seals: Fill entire opening with sealing compound. Adhere to manufacturer's installation instructions.
F. Water Hammer Arresters: Install in upright position, in locations and of sizes in accordance with PDI Standard WH-201, and elsewhere as indicated.

3.2 INSTALLATION OF FABRICATED PIPING SPECIALTIES:
A. Drip Pans: Locate drip pans under piping passing over or within 3' horizontally of electrical equipment, and elsewhere as indicated. Hang from structure with rods and building attachments, weld rods to sides of drip pan. Brace to prevent sagging or swaying. Connect 1" drain line to drain connection, and run to nearest plumbing drain or elsewhere as indicated.
B. Pipe Sleeves: Install pipe sleeves of types indicated where piping passes through walls, floors, ceilings, and roofs. Do not install sleeves through structural members of work, except as detailed on drawings, or as reviewed by Architect/Engineer. Install sleeves accurately centered on pipe runs. Size sleeves so that piping and insulation (if any) will have free movement in sleeve, including allowance for thermal expansion;

but not less than 2 pipe sizes larger than piping run. Where insulation includes vapor-barrier jacket, provide sleeve with sufficient clearance for installation. Install length of sleeve equal to thickness of construction penetrated, and finish flush to surface; except floor sleeves. Extend floor sleeves 1/4" above level floor finish, and 3/4" above floor finish sloped to drain. Provide temporary support of sleeves during placement of concrete and other work around sleeves, and provide temporary closure to prevent concrete and other materials from entering sleeves.

1. Install sheet-metal sleeves at interior partitions and ceilings other than suspended ceilings.
2. Install iron-pipe sleeves at exterior penetrations; both above and below grade.
3. Install steel-pipe or plastic-pipe sleeves except as otherwise indicated.

C. Sleeve Seals: Install in accordance with the following:
   1. Lead and Oakum: Fill and pack annular space between sleeve and pipe with oakum, caulk with lead, on both sides.

END OF SECTION

SECTION 15140 – SUPPORTS AND ANCHORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:
- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 00 Specification sections, apply to work of this section.
- B. This section is Division 15 Basic Mechanical Materials and Methods section, and is part of each Division 15 section making reference to supports and anchors specified herein.

1.2 DESCRIPTION OF WORK:
- A. Extent of supports and anchors required by this section is indicated on drawings and/or specified in other Division 15 sections.
- B. Types of supports and anchors specified in this section include the following:
  1. Horizontal-Piping Hangers and Supports.
  2. Hanger-Rod Attachments.
  3. Building Attachments.
  4. Saddles and Shields.
  5. Miscellaneous Materials.
  6. Anchors.
  7. Equipment Supports.
- C. Supports and anchors furnished as part of factory-fabricated equipment are specified as part of equipment assembly in other Division 15 sections.

1.3 QUALITY ASSURANCE:
- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of supports and anchors, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Codes and Standards:
  1. Code Compliance: Comply with Florida Building Code pertaining to product materials and installation of supports and anchors.
  2. UL and FM Compliance: Provide products which are UL-listed and FM approved.
  3. MSS Standard Compliance:
     a. Provide pipe hangers and supports of which materials, design, and manufacture comply with MSS SP-58.
     b. Select and apply pipe hangers and supports, complying with MSS SP-69.
     c. Fabricate and install pipe hangers and supports, complying with MSS SP-89.
     d. Terminology used in this section is defined in MSS SP-90.

1.4 SUBMITTALS:
- A. Product Data: Submit manufacturer's technical product data, including installation instructions for each type of support and anchor.
- B. Shop Drawings: Submit manufacturer's assembly-type shop drawings for each type of support and anchor, indicating dimensions, weights, required clearances, and methods of assembly of components.

PART 2 - PRODUCTS

2.1 HORIZONTAL-PIPING HANGERS AND SUPPORTS:
- A. General: Except as otherwise indicated, provide factory-fabricated horizontal-piping hangers and supports complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal-piping systems, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hangers and supports to exactly fit pipe size for bare piping, and to exactly fit around piping insulation with saddle or shield for insulated piping. Provide copper-plated hangers and supports for copper-piping systems.
- B. Adjustable Steel Clevis Hangers: MSS Type 1.
- C. Steel Double Bolt Pipe Clamps: MSS Type 3.
- D. Steel Pipe Clamps: MSS Type 4.
- E. Pipe Hangers: MSS Type 5.
- F. Split Pipe Rings: MSS Type 11.
- G. Clips: MSS Type 26.
- H. Pipe Saddle Supports: MSS Type 36, including steel pipe base-support and cast-iron floor flange.
- I. Pipe Stanchion Saddles: MSS Type 37, including steel pipe base-support and cast-iron floor flange.

2.2 HANGER ROD ATTACHMENTS:
A. General: Except as otherwise indicated, provide factory-fabricated hanger-rod attachments complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit horizontal-piping hangers and building attachments, in accordance with MSS SP-69 and manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hanger-rod attachments to suit hanger rods. Provide copper-plated hanger-rod attachments for copper-piping systems.
B. Steel Turnbuckles: MSS Type 13.

2.3 BUILDING ATTACHMENTS:
A. General: Except as otherwise indicated, provide factory-fabricated building attachments complying with MSS SP-58, of one of the following MSS types listed, selected by Installer to suit building substrate conditions, in accordance with MSS SP-69 and manufacturer's published product information. Select size of building attachments to suit hanger rods. Provide copper-plated building attachments for copper-piping systems.
B. Concrete Inserts: MSS Type 18.
C. Top Beam C-Clamps: MSS Type 19.
D. Side Beam or Channel Clamps: MSS Type 20.
E. Center Beam Clamps: MSS Type 21.
F. Steel Brackets: One of the following for indicated loading:
1. Light Duty: MSS Type 31.
2. Medium Duty: MSS Type 32.
3. Heavy Duty: MSS Type 33.

2.4 SADDLES AND SHIELDS:
A. General: Except as otherwise indicated, provide saddles or shields under piping hangers and supports, factory-fabricated, for all insulated piping. Size saddles and shields for exact fit to mate with pipe insulation.
B. Protection Saddles: MSS Type 39; fill interior voids with segments of insulation matching adjoining insulation.
C. Protection Shields: MSS Type 40; of length recommended by manufacturer to prevent crushing of insulation.
D. Thermal Hanger Shields: Constructed of 360° insert of high density, 100 psi, water-proofed calcium silicate, encased in 360° sheet metal shield. Provide assembly of same thickness as adjoining insulation.
E. Manufacturer: Subject to compliance with requirements, provide thermal hanger shields of one of the following:
1. Elcen Metal Products Co.
2. Pipe Shields, Inc.

2.5 MANUFACTURERS OF HANGERS AND SUPPORTS:
A. Manufacturer: Subject to compliance with requirements, provide hangers and supports of one of the following:
1. B-Line Systems, Inc.
2. Carpenter and Patterson, Inc.
3. Corner & Lada Co., Inc.
4. Elcen Metal Products Co.
5. Fee & Mason Mfg. Co.; Div. Figgie International.
6. ITT Grinnel Corp.

2.6 MISCELLANEOUS MATERIALS:
A. Metal Framing: Provide products complying with NEMA STD ML 1.
B. Steel Plates, Shapes, and Bars: Provide products complying with ASTM A36.
C. Cement Grout: Portland cement (ASTM C 150, Type I or Type III) and clean uniformly graded, natural sand (ASTM C 404, Size No. 2). Mix at a ratio of 1.0 part cement to 3.0 parts sand, by volume, with minimum amount of water required for placement and hydration.

PART 3 - EXECUTION

3.1 INSPECTION:
A. Examine areas and conditions under which supports and anchors are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 PREPARATION:
A. Proceed with installation of hangers, supports, and anchors only after required building structural work has been completed in areas where the work is to be installed. Correct the inadequacies, including (but not limited to) proper placement of inserts, anchors, and other building structural attachments.

B. Prior to installation of hangers, supports, anchors, and associated work, Installer shall meet at project site with Contractor, installer of each component of associated work, inspection and testing agency representatives (if any), installers of other work requiring coordination with work of this section and Architect/Engineer for purpose of reviewing material selections and procedures to be followed in performing the work in compliance with requirements specified.

3.3 INSTALLATION OF BUILDING ATTACHMENTS:

A. Install building attachments at required locations within concrete or on structural steel for proper piping support. Space attachments within maximum piping span length indicated in MSS SP-69. Install any additional concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten insert securely to forms. Where concrete with compressive strength less than 2,500 psi is indicated, install reinforcing bars through openings at top of inserts.

3.4 INSTALLATION OF HANGERS AND SUPPORTS:

A. General: Install hangers, supports, clamps, and attachments to support piping properly from building structure; comply with MSS SP-69. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Install supports with maximum spacings complying with MSS SP-69. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use wire or perforated metal to support piping, and do not support piping from other piping.

B. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories. Except as otherwise indicated for exposed continuous pipe runs, install hangers and supports of same type and style as installed for adjacent similar piping.

C. Prevent electrolysis in support of copper tubing by use of hangers and supports which are copper plated, or by other recognized industry methods.

D. Provisions for movement: Install hangers and supports to allow controlled movement of piping systems and to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

E. Load Distribution: Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.

F. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes, and so that maximum pipe deflections allowed by ANSI B31 Pressure Piping Codes are not exceeded.

G. Insulated Piping: Comply with the following installation requirements.

1. Clamps: Attach clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ANSI B31.
2. Shields: Where low-compressive-strength insulation or vapor barriers are indicated on cold or chilled water piping, install coated protective shields.
3. Saddles: Where insulation without vapor barrier is indicated, install protection saddles.

3.5 INSTALLATION OF ANCHORS:

A. Install anchors at proper locations to prevent stresses from exceeding those permitted by ANSI B31, and to prevent transfer of loading and stresses to connected equipment.

B. Fabricate and install anchor by welding steel shapes, plates and bars to piping and to structure. Comply with ANSI B31 and with AWS standards.

C. Anchor Spacings: Where not otherwise indicated, install anchors at ends of principal pipe-runs, at intermediate points in pipe-runs between expansion loops and bends. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.

3.6 EQUIPMENT SUPPORTS:

A. Provide concrete housekeeping bases for all floor-mounted equipment furnished as part of the work of Division 15. Size bases to extend minimum of 4" beyond equipment base in any direction; and 4" above finished floor elevation. Construct of reinforced concrete, roughen floor slab beneath base for bond, and provide steel rod anchors between floor and base. Locate anchor bolts using equipment manufacturer's templates. Chamfer top and edge corners.

B. Provide structural steel stands to support equipment not floor mounted or hung from structure. Construct of structural steel members or steel pipe and fittings. Provide factory-fabricated tank saddles for tanks mounted on steel stands.

3.7 ADJUSTING AND CLEANING:

A. Hanger Adjustments: Adjust hangers so as to distribute loads equally on attachments.

B. Supports Adjustment: Provide grout under supports so as to bring piping and equipment to proper level and elevations.

C. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

END OF SECTION

SECTION 15250 - MECHANICAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:
- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 00 Specification sections, apply to work of this section.
- B. Division 15 Basic Mechanical Materials and Methods sections apply to work of this section.

1.2 DESCRIPTION OF WORK:
- A. Extent of mechanical insulation required by this section is indicated on drawings and schedules, and by requirements of this section.
- B. Types of mechanical insulation specified in this section include the following:
  1. Piping System Insulation:
     a. Fiberglass
     b. Cellular Glass.
     c. Flexible Unicellular.
  2. Duct Work System Insulation:
     a. Fiberglass.
  3. Equipment Insulation:
     a. Cellular Glass.
- C. Refer to Division 15 section "Supports and Anchors" for protection saddles, protection shields, and thermal hanger shields; not work of this section.
- D. Refer to Division 15 section "Mechanical Identification" for installation of identification devices for piping, ductwork, and equipment; not work of this section.

1.3 QUALITY ASSURANCE:
- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of mechanical insulation products, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 3 years.
- B. Installer's Qualifications: Firm with at least 5 years successful installation experience on projects with mechanical insulations similar to that required for this project.
- C. Flame/Smoke Ratings: Provide composite mechanical insulation (insulation, jackets, coverings, sealers, mastics and adhesives) with flame-spread index of 25 or less, and smoke-developed index of 50 or less, as tested by ASTM E 84 (NFPA 255) method.
- D. Exception: Outdoor mechanical insulation may have flame spread index of 75 and smoke developed index of 150.

1.4 SUBMITTALS:
- A. Product Data: Submit manufacturer's technical product data and installation instructions for each type of mechanical insulation. Submit schedule showing manufacturer's product number, k-value, thickness, and furnished accessories for each mechanical system requiring insulation.
- B. Maintenance Data: Submit maintenance data and replacement material lists for each type of mechanical insulation. Include this data and product data in maintenance manual.

1.5 DELIVERY, STORAGE, AND HANDLING:
- A. Deliver insulation, coverings, cements, adhesives, and coatings to site in containers with manufacturer's stamp or label, affixed showing fire hazard indexes of products.
- B. Protect insulation against dirt, water, and chemical and mechanical damage. Do not install damaged or wet insulation; remove from project site.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS:
- A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:
  1. Armstrong World Industries, Inc.
  2. CertainTeed Corp.
  3. Knauf Fiber Glass GmbH.
  4. Manville Products Corp.
  5. Owens-Corning Fiberglas Corp.
  6. Pittsburgh Corning Corp.
  7. Rubatex Corp.

2.2 PIPING INSULATION MATERIALS:
- A. Fiberglass Piping Insulation: ASTM C 547, Class 1.
- B. Cellular Glass Piping Insulation: ASTM C 552, Type II, Class 2.
- C. Flexible Unicellular Piping Insulation: ASTM C 534, Type I.
- D. Jackets for Piping Insulation: ASTM C 921, Type I for piping with temperatures below ambient, Type II for piping with temperatures above ambient. Type I may be used for all piping at Installers option.
- E. Encase pipe fittings insulation with one-piece premolded PVC fitting covers, fastened as per manufacturer's recommendations.
- F. Encase **exterior piping insulation and piping insulation in mechanical rooms** up to 6 feet above the floor with aluminum jacket. Aluminum jackets shall cover all fittings and valves for 100% coverage. PVC fitting covers are not permissible.
- G. Staples, Bands, Wires, and Cement: As recommended by insulation manufacturer for applications indicated.
- H. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- I. Adhesives, Sealers, and Protective Finishes: As recommended by insulation manufacturer for applications indicated.
  1. For indoor applications, use adhesive that has a VOC content of 50 g/L, or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  2. Use adhesive that complies 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," including 2004 Addenda.

2.3 DUCTWORK INSULATION MATERIALS:
- A. Rigid Fiberglass Ductwork Insulation: ASTM C 612, Class 1.
- B. Flexible Fiberglass Ductwork Insulation: ASTM C 553, Type I, Class B-4.
- C. Jackets for Ductwork Insulation: ASTM C 921, Type I.
- D. Ductwork Insulation Accessories: Provide staples, bands, wires, tape, anchors, corner angles and similar accessories as recommended by insulation manufacturer for applications indicated.
- E. Ductwork Insulation Compounds: Provide cements, adhesives, coatings, sealers, protective finishes and similar compounds as recommended by insulation manufacturer for applications indicated.
  1. For indoor applications, use adhesive that has a VOC content of 50 g/L, or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  2. Use adhesive that complies 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," including 2004 Addenda.

2.4 EQUIPMENT INSULATION MATERIALS:
- A. Cellular Glass Equipment Insulation: ASTM C 552, Type I.
- B. Jacketing Material for Equipment Insulation: Provide pre-sized glass cloth jacketing material, not less than 7.8 ounces per square yard, or metal jacket at Installer's option, except as otherwise indicated.
- C. Equipment Insulation Compounds: Provide adhesives, cements, sealers, mastics and protective finishes as recommended by insulation manufacturer for applications indicated.
  1. For indoor applications, use adhesive that has a VOC content of 50 g/L, or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  2. Use adhesives and sealants that 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," including 2004 Addenda.
- D. Equipment Insulation Accessories: Provide staples, bands, wire, wire netting, tape, corner angles, anchors and stud pins as recommended by insulation manufacturer for applications indicated.

PART 3 - EXECUTION

3.1 INSPECTION:
- A. Examine areas and conditions under which mechanical insulation is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 HVAC PIPING SYSTEM INSULATION:
- A. Insulation Omitted: Omit insulation on hot piping within radiation enclosures or unit cabinets; on cold piping within unit cabinets provided piping is located over drain pan; on heating piping beyond control valve, located within heated space; on condensate piping between steam trap and union; and on unions, flanges, strainers, flexible connections, and expansion joints.
- B. Cold Piping (40°F (4.4°C) to ambient).
  1. Application Requirements: Insulate the following cold HVAC piping systems:

a. HVAC chilled water supply and return piping.
b. Air conditioning condensate drain piping.

2. Insulate each piping system specified above with one of the following types and thicknesses of insulation:
   a. Cellular Glass:
      aa. The insulation thickness in inches, unless otherwise specifically indicated, shall be in accordance with the following table:

TABLE - CELLULAR GLASS PIPING INSULATION THICKNESS

Pipe Size, Inches	Up to 1	1-1/4 to 2	2-1/2 to 4	5 to 6	8 & Up
Chilled Water	1-1/2	1-1/2	1-1/2	1-1/2	1-1/2
Glycol or Brine	1-1/2	1-1/2	2	2	2

   b. For piping exposed to the outdoor air, increase insulation thickness by 1/2 inch. Provide insulation in 2 layers for 1-1/2 inch thickness or greater.

3.3 DUCTWORK SYSTEM INSULATION:

A. Insulation Omitted: Do not insulate fibrous glass ductwork, or lined ductwork.
B. Cold Ductwork (Below Ambient Temperature):
   1. Application Requirements: Insulate the following cold ductwork.
      a. Outdoor air intake ductwork between air entrance and fan inlet or HVAC unit inlet.
      b. HVAC supply ductwork between fan discharge, or HVAC unit discharge, and room terminal outlet.
      c. Insulate neck and bells of supply diffusers.
      d. HVAC return ductwork between room terminal inlet and return fan inlet, or HVAC unit inlet; except omit insulation on return ductwork located in return air ceiling plenums.
      e. HVAC plenums and unit housings not pre-insulated at factory or lined.
   2. Insulate each ductwork system specified above with one of the following types and thicknesses of insulation:
      a. Rigid Fiberglass: 1-1/2" thick, increase thickness to 2" in machine, fan and equipment rooms, or
      b. Flexible Fiberglass: 1-1/2" thick, application limited to concealed locations.

3.4 EQUIPMENT INSULATION:

A. Cold Equipment (Below Ambient Temperature):
   1. Application Requirements: Insulate the following cold equipment:
      a. Cold equipment, including chillers, tanks, valve bodies, strainers and pumps.
      b. Drip pans under chilled equipment.
      c. Cold and chilled water pumps.
      d. Roof drain bodies.
   2. Insulate each item of equipment specified above with one of the following types and thicknesses of insulation:
      a. Cellular Glass: 3" thick for surfaces above 35°F (2°C) and 4- 1/2" thick for surfaces 35°F (2°C) and lower (cold and chilled water pumps, expansion tanks, and air and solids separators).
      b. Flexible Unicellular: 1" thick (roof drain bodies and drip pans).

3.5 INSTALLATION OF DUCTWORK INSULATION:

A. General: Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that insulation serves its intended purpose.
B. Install insulation materials with smooth and even surfaces.
C. Clean and dry ductwork prior to insulating. Butt insulation joints firmly together to ensure complete and tight fit over surfaces to be covered.
D. Maintain integrity of vapor-barrier on ductwork insulation, and protect it to prevent puncture and other damage.
E. Extend ductwork insulation without interruption through walls, floors, and similar ductwork penetrations, except where otherwise indicated.
F. Corner Angles: Install corner angles on external corners of insulation on ductwork in exposed finished spaces before covering with jacketing.

3.6 INSTALLATION OF EQUIPMENT INSULATION:

A. General: Install equipment thermal insulation products in accordance with manufacturer's written instructions, and in compliance with recognized industry practices to ensure that insulation serves intended purpose.
B. Install insulation materials with smooth and even surfaces and on clean and dry surfaces. Redo poorly fitted joints. Do not use mastic or joint sealer as filler for gapping joints and excessive voids resulting from poor workmanship.

C. Maintain integrity of vapor-barrier on equipment insulation and protect it to prevent puncture and other damage.
D. Apply insulation using staggered joint method for both single and double layer construction, where feasible. Apply each layer of insulation separately.
E. Coat insulated surfaces with layer of insulating cement, troweled in workmanlike manner, leaving smooth continuous surface. Fill in scored block, seams, chipped edges and depressions, and cover over wire netting and joints with cement of sufficient thickness to remove surface irregularities.
F. Cover insulated surfaces with all-service jacketing neatly fitted and firmly secured. Lap seams at least 2". Apply over vapor barrier where applicable.
G. Do not insulate handholes, cleanouts, ASME stamp, and manufacturer's nameplate. Provide neatly beveled edge at interruptions of insulation.
H. Provide removable insulation sections to cover parts of equipment which must be opened periodically for maintenance; include metal vessel covers, fasteners, flanges, frames, and accessories.
I. Equipment Exposed to Weather: Protect outdoor insulation from weather by installation of weather-barrier mastic protective finish, or jacketing, as recommended by manufacturer.

3.9 PROTECTION AND REPLACEMENT:
A. Replace damaged insulation which cannot be satisfactorily, including units with vapor barrier damage and moisture saturated units.
B. Protection: Insulation installer shall advise Contractor of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.

END OF SECTION

SECTION 15300 – WATER BASED FIRE PROTECTION SYSTEMS

PART 1 GENERAL

1.1 RELATED DOCUMENTS:
- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.
- B. Division 15 Basic Mechanical Materials and Methods sections apply to work of this section.

1.2 DESCRIPTION OF WORK:
- A. Extent of fire protection work is indicated on drawings and schedules, and by requirements of this section.
- B. Refer to other specification sections for fire protection piping and appurtenances exterior to building, fire extinguishers, and fire extinguisher cabinets and accessories; not work of this section.

1.3 QUALITY ASSURANCE:
- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of fire protection products, of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects with fire protection work similar to that required for project and a Class I or II Florida Fire Protection Contractor License.
- C. Codes and Standards:
  1. NFPA Compliance: Install fire protection systems in accordance with NFPA 13 "Standard for the Installation of Sprinkler Systems", NFPA 24, Florida Fire Prevention Code, and the State Requirements for Educational Facilities.
  2. UL Compliance: Provide fire protection products in accordance with UL standards; provide UL label on each product.
  3. FM Compliance: Provide fire protection products and installations in accordance with FM standards; provide FM label on each product.
  4. Fire Department/Marshal Compliance: Install fire protection systems in accordance with local regulations of fire department or fire marshal.
  5. Screw Thread Connections: Comply with local Fire Department/ Marshal Regulations for sizes, threading and arrangement of connections for fire department equipment to standpipe systems.

1.4 SUBMITTALS:
- A. Product Data: Submit manufacturer's technical product data and installation instructions for fire protection materials and products.
- B. Working Plans: Prepare 1/8” scaled layout drawings for fire protection pipe and fittings including, but not necessarily limited to, pipe and tube sizes, locations, elevations, and slopes of horizontal runs, wall and floor penetrations, and connections. Indicate interface and spatial relationship between piping and proximate equipment. Plans shall be signed and sealed by a Professional Engineer Registered in the state of Florida and submitted to Agency having jurisdiction for approval. Submit one approved copy, bearing stamp and/or signature of Agency having jurisdiction, before proceeding with installation. PRIOR TO ISSUING PLANS, CONTRACTOR SHALL ASK PERMISSION, IN WRITING, TO BECOME ENGINEER OF RECORD TO HARRY W. PORTELLOS, P.E.. HARRY W. PORTELLOS, P.E. WILL RELINQUISH TITLE OF ENGINEER OF RECORD, IN WRITING, TO THE ENGINEER OF RECORD STATED ABOVE.
- C. Hydraulic Calculations: Prepare hydraulic calculations of fire protection systems. Calculations shall be signed and sealed by a Professional Engineer Registered in the state of Florida and submitted to Agency having jurisdiction for approval. Submit one approved copy, bearing stamp and/or signature of Agency having jurisdiction, before proceeding with installation. PRIOR TO ISSUING CALCULATIONS, CONTRACTOR SHALL ASK PERMISSION, IN WRITING, TO BECOME ENGINEER OF RECORD TO HARRY W. PORTELLOS, P.E.. HARRY W. PORTELLOS, P.E. WILL RELINQUISH TITLE OF ENGINEER OF RECORD, IN WRITING, TO THE ENGINEER OF RECORD STATED ABOVE.
- D. Certificate of Installation: Submit certificate upon completion of fire protection piping work which indicates that work has been tested in accordance with NFPA 13 and NFPA 24, and also that system is operational, complete, and has no defects.
- E. Record Drawings: At project closeout, submit record drawings of installed fire protection piping and products; in accordance with requirements of Division 00.
- F. Maintenance Data: Submit maintenance data and parts lists for fire protection materials and products. Include this data, product data, shop drawings, approval drawings, approval calculations, certificate of installation, and record drawings in maintenance manual; in accordance with requirements of Division 00.

PART 2 PRODUCTS

2.1 MATERIALS AND PRODUCTS:

A. General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials used in fire protection systems. Where more than one type of materials or products are indicated, selection is Installer's option. All items of similar type shall be by the same manufacturer. Materials, sprinkler devices, pipe fittings, valves and hangers provided for the system shall be on the approved or acceptable list of the 2010 issue of Inspected Fire Protection Equipment and Materials, as published by the Underwriters Laboratories, Inc. and shall be NFPA approved, as well as acceptable to the underwriters and the District.

2.2 BASIC IDENTIFICATION:

A. General: Provide identification complying with Division 15 specification section "Mechanical Identification", in accordance with the following listing:
   1. Fire Protection Piping: Plastic pipe markers.
   2. Fire Protection Signs: Provide the following signs:
      a. At each control valve, sign indicating what portion of system valve controls.
      b. At each alarm valve, sign indicating what authority to call if device is activated.
      c. At each test valve, sign indicating what portion of system valve controls.
      d. At each drain valve, sign indicating what portion of system valve controls.
   3. Signs shall be minimum 20 gauge sheet metal, pickled and treated, with baked on enamel white lettering and border on red background.

2.3 BASIC PIPES AND PIPE FITTINGS:

A. General: Provide pipes and pipe fittings complying with Division 15 specification section "Pipes and Pipe Fittings", in accordance with the following listing:

B. Piping 2-1/2” and larger shall be schedule 10 lightwall. Piping 2” and smaller shall be Allied XL or Schedule 40.

C. Manufacturer of Above Ground Piping: Subject to compliance with requirements, provide fire protection above ground piping of one of the following or approved equivalent:
   1. Allied Tube and Conduit
   2. Bull Moose Tube Co.
   3. Wheatland Tube Co.
   4. Or approved equivalent.

D. Manufacturer of Threaded Fittings: Subject to compliance with requirements, provide threaded fittings of one of the following or approved equivalent:
   1. Star
   2. Anvil
   3. Reliable
   4. Or approved equivalent.

E. Manufacturer of Grooved Mechanical Fittings: Subject to compliance with requirements, provide grooved mechanical fittings of one of the following or approved equivalent:
   1. Victaulic
   2. Gruvlock
   3. Star
   4. Or approved equivalent.

F. Manufacturer of Cast Iron Flanged Fittings: Subject to compliance with requirements, provide cast iron flanged fittings of one of the following or approved equivalent:
   1. Viking
   2. Anvil
   3. Reliable
   4. Or approved equivalent.

2.4 BASIC PIPING SPECIALTIES:

A. General: Provide piping specialties complying with Division 15 specification section "Piping Specialties", in accordance with the following listing:
   1. Pipe escutcheons.
   2. Dielectric unions.
   3. Drip pans.
   4. Pipe sleeves.
   5. Sleeve seals.

6. Fire Barrier Penetration Seals.

2.5 BASIC SUPPORTS AND ANCHORS:
A. General: Provide supports and anchors complying with Division 15 specification section "Supports and Anchors", in accordance with the following listing:
1. Adjustable steel clevis hangers, adjustable steel band hangers, or adjustable band hangers, for horizontal-piping hangers and supports.
2. Two-bolt riser clamps for vertical piping supports.
3. Steel turnbuckles and malleable iron sockets for hanger-rod attachments.
4. Top-beam C-clamps, side beam or channel clamps or center beam clamps for building attachments.
5. Hangers and rods shall be galvanized.
6. Hangers shall be UL listed and FM approved.
B. Piping for drainage shall be Schedule 40 galvanized steel pipe ASTM A795 or A135 with galvanized fittings.
C. See drawings for additional piping requirements.

2.6 BASIC VALVES:
A. General: Provide valves complying with Division 15 specification section "Valves", in accordance with the following listing:
1. Interior Valves:
a. Sectional: Gate valves or butterfly valves; UL listed.
b. Check: Swing check valves; UL listed.
B. Manufacturer of Valves: Subject to compliance with requirements, provide valves of one of the following or approved equivalent:
1. Tyco-Central
2. Reliable
3. Victaulic
4. Or approved equivalent.

2.7 SPECIAL VALVES:
A. General: Provide valves, UL listed, in accordance with the following listing. Provide sizes and types which mate and match piping and equipment connections.
B. Alarm Check Valve: Provide cast-iron water flow alarm check valve, 175 psi working pressure.
C. Hose Outlet Valves: Provide angle hose valves, 2-1/2" size where not otherwise indicated.
D. Fire Department Connection Valve: Provide fire department connection iron swing check valve, 175 psi rated working pressure, of size and end type indicated.
E. Angle Hose Valve: Provide angle hose valve of type and in cabinet as required by drawing notes., with cast brass body and solid cast aluminum red wheel handle, UL listed and FM approved.

2.8 BASIC METERS AND GAGES:
A. General: Provide meters and gages complying with Division 15 specification section "Meters and Gages", in accordance with the following listing:
1. Pressure gages, 0-250 psi range.

2.9 FIRE PROTECTION SPECIALTIES:
A. General: Provide fire protection specialties, UL listed, in accordance with the following listing. Provide sizes and types which mate and match piping and equipment connections.
B. Water Flow Indicators: Provide vane type water flow detectors with adjustable retard setting from 0 to 70 seconds.
C. Supervisory Switches: Provide products recommended by manufacturer for use in service indicated.
D. Manufacturer: Subject to compliance with requirements, provide fire protection specialties of one of the following or approved equivalent:
1. Allen (W.D.) Mfg. Co.; Div. of J.W. Moon, Inc.
2. Croker-Standard Div.; Fire-End & Croker Corp.
3. Elkhart Brass Mfg. Co., Inc.
4. Grinnell Fire Protection Systems Co., Inc.
5. Grunau Sprinkler Mfgr. Co., Inc.
6. Guardian Fire Equipment, Inc.
7. Potter Roemer, Inc.
8. Western Fire Equipment Co.; Div. of Premier Industrial.
9. Or approved equivalent.

E. Provide inspector’s test and drains with 2 view windows.

2.10 AUTOMATIC SPRINKLERS:
- A. General: Provide automatic sprinklers of type indicated on Drawings, and in accordance with the following listing.
  1. Standard upright
  2. Standard recessed pendent
  3. Extended coverage recessed pendent
  4. Dry-Type standard side-wall
- B. Finish: Chrome plate for occupied areas, cast brass for unoccupied areas.
- C. Sprinkler Cabinet and Wrench: Furnish steel, baked red enameled, sprinkler box with capacity to store number of sprinklers required by NFPA13 and wrench sized to sprinklers. Locate cabinet near riser.
- D. Manufacturer: Subject to compliance with requirements, provide automatic sprinklers of one of the following or approved equivalent:
  1. Tyco-Central
  2. Reliable
  3. Viking
  4. Or approved equivalent.

PART 3 EXECUTION

3.1 INSPECTION:
- A. General: Examine areas and conditions under which fire protection materials and products are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Owner.

3.2 INSTALLATION OF BASIC IDENTIFICATION:
- A. General: Install mechanical identification in accordance with Division 15 specification section "Mechanical Identification".
- B. Install fire protection signs on piping in accordance with NFPA 13.

3.3 INSTALLATION OF PIPES AND PIPE FITTINGS:
- A. General: Install pipes and pipe fittings in accordance with Division 15 specification section "Pipes and Pipe Fittings".
- B. Comply with requirements of NFPA 13 and NFPA 24 for installation of fire protection piping materials. Install piping products where indicated, in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that piping systems comply with requirements and serve intended purposes.
- C. Coordinate with other work, including plumbing piping, as necessary to interface components of fire protection piping properly with other work.
- D. Install drain piping at low points of piping systems.
- E. Install hose outlet valves in piping where hose outlets are indicated.
- F. Install sectional valves in inlet piping, at bottom of each riser, and in loops as indicated.
- G. Install fire department connection check valves in piping where fire department connections are indicated.
- H. Install water flow indicators where indicated.
- I. Mount supervisory switches on each sectional valve.
- J. Install pressure gages on system side of all control valves.
- K. Install manual shutoff at each audible alarm station.
- L. Install Inspector's test connection where indicated, or at most remote point from riser.

3.4 INSTALLATION OF PIPING SPECIALTIES:
- A. Install piping specialties in accordance with Division 15 specification section "Piping Specialties".

3.5 INSTALLATION OF SUPPORTS AND ANCHORS:
- A. Install supports and anchors, in accordance with Division 15 specification section "Supports and Anchors".

3.6 INSTALLATION OF VALVES:
- A. Install valves in accordance with Division 15 specification section "Valves".
- B. Detector Check Valves: Install in horizontal position as indicated, orientated for proper flow direction. Install by-pass meter with globe valve and check valve, in accordance with manufacturer's installation directions.
- C. All control, drain, and inspector’s test valves shall be located within 7 feet of the floor to allow access without the aid of ladders, but shall not be located in areas accessible to the student population.
- D. Inspectors test and main drains shall penetrate exterior walls at a maximum of 24 inches above grade and shall be provided with concrete splash blocks.

3.7 INSTALLATION OF METERS AND GAGES:
A. Install meters and gages in accordance with Division 15 specification section "Meters and Gages".

3.8 INSTALLATION OF FIRE PROTECTION SPECIALTIES:
A. General: Install fire protection specialties as indicated, and in accordance with NFPA 13 and 24.
B. Furnish wiring requirements to electrical Installer for electrical wiring of supervisory switches.

3.9 FIELD QUALITY CONTROL:
A. Sprinkler Piping Flushing: Prior to connecting sprinkler risers for flushing, flush water feed mains, lead-in connections and control portions of sprinkler piping. After fire sprinkler piping installation has been completed and before piping is placed in service, flush entire sprinkler system, as required to remove foreign substances, under pressure as specified in NFPA 13. Continue flushing until water is clear, and check to ensure that debris has not clogged sprinklers.
B. Hydrostatic Testing: After flushing system, test fire sprinkler piping hydrostatically, for period of 2 hours, at not less than 200 psi or at 50 psi in excess of maximum static pressure when maximum static pressure is in excess of 150 psi. Check system for leakage of joints. Measure hydrostatic pressure at low point of each system or zone being tested. Written notification of the test shall be received by the owner a minimum of 48 hours prior to the test. The owner shall, at his option, witness the test.
C. Repair or replace piping system as required to eliminate leakage in accordance with NFPA standards for "little or no leakage" and retest as specified to demonstrate compliance.
D. Provide a flow test on the new hydrant, if provided (refer to the civil drawings). Perform the test to establish that the actual flow meets the specified flow indicated in the drawings.

3.10 ADJUSTING AND CLEANING:
A. Cleaning and Inspecting: Clean and inspect fire protection systems in accordance with requirements of Division 15 specification section "Pipes and Pipe Fittings".

3.11 EXTRA STOCK:
A. Heads: Per NFPA 13.
B. Wrenches: Furnish 2 spanner wrenches for each type and size of valve connection and fire hose coupling.
C. Obtain receipt from Owner that extra stock has been received.

3.12 FIRE STOPPING
A. All pipes passing through rated floor or walls shall be sleeved and firestopped to or equivalent ratings of the floor or wall assembly. Firestop materials shall meet ASTM E814 requirements.

3.13 SPRINKLER:
A. Install sprinkler in center of ceiling tiles. It is the contractor’s option to use swing joints or flexible sprinkler drops to accomplish this. Hydraulic calculations shall include losses for swing joints or flexible sprinkler drops.

3.14 SYSTEM INSPECTION AND CHECKOUT
A. After the installation is complete, the system shall be inspected by factory trained personnel in accordance with the manufacturer’s recommended procedure.

END OF SECTION

SECTION 15411 - POTABLE WATER SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:
- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 00 Specification sections, apply to work of this section.
- B. Division 15 Basic Mechanical Materials and Methods sections apply to work of this section.

1.2 DESCRIPTION OF WORK:
- A. Extent of potable water systems work, is indicated on drawings and schedules, and by requirements of this section.
- B. Insulation for potable water piping is specified in other Division 15 sections, and is included as work of this section.
- C. Refer to other Division 15 sections for plumbing equipment; not work of this section.
- D. Refer to other Division 15 sections for plumbing fixtures; not work of this section.
- E. Trenching and backfill required in conjunction with exterior water piping is specified in other applicable specification sections, and is included as work of this section.
- F. Trenching and backfill required in conjunction with potable water piping inside of building foundations is specified in other specification sections, and is included as work of this section.

1.3 QUALITY ASSURANCE:
- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of potable water systems products, of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects with potable water systems work similar to that required for project.
- C. Codes and Standards:
  1. Plumbing Code Compliance: Comply with applicable portions of Florida Building Code – Plumbing pertaining to selection and installation of plumbing materials and products.

1.4 SUBMITTALS:
- A. Product Data: Submit manufacturer's technical product data and installation instructions for potable water systems materials and products.
- B. Record Drawings: At project closeout, submit record drawings of installed potable water systems piping and piping products, in accordance with requirements of Division 00.
- C. Maintenance Data: Submit maintenance data and parts lists for potable water systems materials and products. Include this data, product data, shop drawings, and record drawings in maintenance manual; in accordance with requirements of Division 00.

PART 2 - PRODUCTS

2.1 MATERIALS AND PRODUCTS:
- A. General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide materials and products complying with Florida Building Code – Plumbing where applicable. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials used in potable water systems. Where more than one type of materials or products are indicated, selection is Installer's option.

2.2 BASIC IDENTIFICATION:
- A. General: Provide identification complying with Division 15 Basic Mechanical Materials and Methods section "Mechanical Identification", in accordance with the following listing:
  1. Potable Water Piping: Plastic pipe markers.
  2. Water Service: Underground-type plastic line markers.

2.3 BASIC PIPES AND PIPE FITTINGS:
- A. General: Provide pipes and pipe fittings complying with Division 15 Basic Mechanical Materials and Methods section "Pipes and Pipe Fittings", in accordance with the following listing:
- B. Interior Water Piping:
  1. Above Ground: Copper tube; Type L, hard-drawn temper; wrought-copper fittings, solder-joints.
  2. Below Ground: Copper tube; Type k, soft annealed; wrought-copper fittings, solder-joints.
- C. Exterior Water Piping:

1. Pipe Size 3" and Smaller: Polyvinyl chloride pipe (PVC), Schedule 40; PVC socket fittings, solvent cement joints.
2. Pipe Size 4" through 12": Polyvinyl chloride (PVC) water pipe; Class 100; cast-iron or ductile-iron fittings, mechanical joints.

2.4 BASIC PIPING SPECIALTIES:
A. General: Provide piping specialties complying with Division 15 Basic Mechanical Materials and Methods section "Piping Specialties", in accordance with the following listing:
1. Pipe escutcheons.
2. Dielectric unions.
3. Mechanical sleeve seals.
4. Water hammer arresters.
5. Pipe sleeves.
6. Sleeve seals.
B. Manufacturer: Subject to compliance with requirements, provide basket strainers of one of the following:
1. Josam Mfg. Co.
2. Metraflex Co.
3. Spirax Sarco.
4. Smith (Jay R.) Mfg. Co.

2.5 BASIC SUPPORTS AND ANCHORS:
A. General: Provide supports and anchors complying with Division 15 Basic Mechanical Materials and Methods section "Supports and Anchors", in accordance with the following listing:
1. Adjustable steel clevises and adjustable pipe saddle supports for horizontal piping hangers and supports.
2. Two-bolt riser clamps for vertical piping supports.
3. Concrete inserts, C-clamps, and steel brackets for building attachments.
4. Protection shields for insulated piping support in hangers.

2.6 BASIC VALVES:
A. General: Provide valves complying with Division 15 Basic Mechanical Materials and Methods section "Valves", in accordance with the following listing:
B. Sectional Valves:
1. 2" and Smaller: Gate valves or ball valves.
2. 2" and Larger: Gate valves.
C. Shutoff Valves:
1. 2" and Smaller: Gate valves or ball valves.
2. 2-1/2" and Larger: Gate valves.
D. Drain Valves:
1. 2" and Smaller: Gate valves or ball valves.
2. 2-1/2" and Larger: Gate valves.
E. Check Valves:
1. All Sizes: Swing check valves

2.7 BALANCE COCKS:
A. Threaded Ends 2" and Smaller: Class 125, bronze body, bronze plug, screw driver operated, straight, or angle pattern.
B. Soldered Ends 2" and Smaller: Class 125, bronze body, bronze plug, screw driver operated, straight or angle pattern.
C. Manufacturer: Subject to compliance with requirements, provide balance cocks of one of the following:
1. American Air Filter Co.
2. Bell & Gossett ITT; Fluid Handling Div.
3. Hammond Valve Corp.
4. Milwaukee Valve Co., Inc.
5. Spirax Sarco.
6. Taco, Inc.

2.8 BIBBS AND FAUCETS:
A. Hose Bibbs:
1. Threaded End: Bronze body, renewable composition disc, tee handle, 3/4" NPT inlet, 3/4" hose outlet.
B. Sill Faucets:
1. Threaded End: Bronze body, renewable composition disc, wheel handle, 3/4" NPT inlet, 3/4" hose outlet.

2. Soldered End: Bronze body, renewable composition disc, wheel handle, 3/4" solder inlet, 3/4" hose outlet.

C. Manufacturer: Subject to compliance with requirements, provide bibbs and faucets of one of the following:
1. Hammond Valve Corp.
2. Lee Brothers; Div. Phelps Dodge Brass Co.
3. Mansfield Plumbing Products.
4. Nibco Inc.
5. Prier Brass Mfg. Co.
6. Tanner Mfg. Co.
7. Watts Regulator Co.

2.9 HYDRANTS:
A. Recessed Wall Hydrants: Cast-bronze box hydrant, chrome plated face, tee handle key, bronze casing, length to suit wall thickness, vacuum breaker, hinged locking cover, 3/4" inlet, hose outlet.
B. Manufacturer: Subject to compliance with requirements, provide hydrants of one of the following:
1. Josam Mfg. Co.
2. Smith, (Jay R.) Mfg. Co.
3. Tyler Pipe; Sub. of Tyler Corp.
4. Woodford Mfg. Co.
5. Zurn Industries Inc, Hydromechanics Div.

2.10 BACKFLOW PREVENTERS:
A. General: Provide reduced pressure principle backflow preventers consisting of assembly including shutoff valves on inlet and outlet, and strainer on inlet. Backflow preventers shall include test cocks, and pressure-differential relief valve located between 2 positive seating check valves. Construct in accordance with ASSE Standard 1013.
B. Manufacturer: Subject to compliance with requirements, provide backflow preventers of one of the following:
1. Febco Sales, Inc.; Subs. of Charles M. Bailey Co., Inc.
2. Hersey Products, Inc.
3. ITT Lawler; Fluid Handling Div.
4. Watts Regulator Co.

2.11 PRESSURE REGULATING VALVES:
A. General: Provide pressure regulating valves, single seated, direct operated type, bronze body, integral strainer, complying with requirements of ASSE Standard 1003. Size for maximum flow rate and inlet and outlet pressures indicated on drawings.
B. Manufacturer: Subject to compliance with requirements, provide pressure regulating valves of one of the following:
1. Cash (A.W.) Valve Mfr. Corp.
2. Cla-Val Co.
3. Spence Engineering Co., Inc.
4. Watts Regulator Co.

2.12 RELIEF VALVES:
A. General: Provide relief valves as indicated, of size and capacity as selected by Installer for proper relieving capacity, in accordance with ASME Boiler and Pressure Vessel Code.
B. Combined Pressure-Temperature Relief Valves: Bronze body, test lever, thermostat, complying with ANSI Z21.22 listing requirements for temperature discharge capacity. Provide temperature relief at 210°F (99°C), and pressure relief at 150 psi.
C. Manufacturer: Subject to compliance with requirements, provide relief valves of one of the following:
1. Cash (A.W.) Valve Mfg. Corp.
2. Conbraco Industries, Inc.
3. Watts Regulator Co.
4. Zurn Industries, Inc.; Wilkins-Regulator Div.

PART 3 - EXECUTION

3.1 INSPECTION:
A. General: Examine areas and conditions under which potable water systems are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSTALLATION OF BASIC IDENTIFICATION:
A. General: Install mechanical identification in accordance with Division 15 Basic Mechanical Materials and Methods section "Mechanical Identification".

3.3 INSTALLATION OF POTABLE WATER DISTRIBUTION PIPING:
- A. General: Install water distribution piping in accordance with Division 15 Basic Mechanical Materials and Methods section "Pipes and Pipe Fittings".
- B. Install piping with 1/32" per foot (1/4%) downward slope towards drain point.
- C. Install piping level with no pitch.
- D. Locate groups of pipes parallel to each other, spaced to permit applying full insulation and servicing of valves.

3.4 INSTALLATION OF EXTERIOR WATER PIPING:
- A. General: Install exterior water service piping system in compliance with local governing regulations.
- B. Water Service Piping: Extend water service piping of size and in location indicated to water service entrance at building. Provide sleeve in foundation wall for water service entry; make entry watertight. Provide shutoff valve at water service entry inside building; strainer, pressure gage, test tee with valve.
- C. PVC: Install in accordance with manufacturers recommendations.

3.5 INSTALLATION OF PIPING SPECIALTIES:
- A. Install piping specialties in accordance with Division 15 Basic Mechanical Materials and Methods section "Piping Specialties".

3.6 INSTALLATION OF SUPPORTS AND ANCHORS:
- A. Install supports and anchors in accordance with Division 15 Basic Mechanical Materials and Methods section "Supports and Anchors".

3.7 INSTALLATION OF VALVES:
- A. Install valves in accordance with Division 15 Basic Mechanical Materials and Methods section "Valves".
- B. Sectional Valves: Install on each branch and riser, close to main, where branch or riser serves 2 or more plumbing fixtures or equipment connections, and elsewhere as indicated.
- C. Shutoff Valves: Install on inlet of each plumbing equipment item, and on inlet of each plumbing fixture, and elsewhere as indicated.
- D. Drain Valves: Install on each plumbing equipment item located to completely drain equipment for service or repair. Install at base of each riser, at base of each rise or drop in piping system, and elsewhere where indicated or required to completely drain potable water system.
- E. Check Valves: Install on discharge side of each pump, and elsewhere as indicated.
- F. Balance Cocks: Install in each hot water recirculating loop, and elsewhere as indicated.
- G. Hose Bibbs: Install on exposed piping where indicated, with vacuum breaker.
- H. Sill Faucets: Install where indicated with vacuum breaker.
- I. Hydrants: Install where indicated, in accordance with manufacturer's installation instructions.

3.8 INSTALLATION OF BACKFLOW PREVENTERS:
- A. Install backflow preventers where indicated, and where required by Florida Building Code – Plumbing. Locate in same room as equipment being protected. Pipe relief outlet to nearest floor drain.

3.9 INSTALLATION OF PRESSURE REGULATING VALVES:
- A. Install pressure regulating valves where indicated. Provide inlet and outlet shutoff valves, and throttling valve bypass. Provide pressure gage on valve outlet.

3.10 EQUIPMENT CONNECTIONS:
- A. Piping Runouts to Fixtures: Provide hot and cold water piping runouts to fixtures of sizes indicated, but in no case smaller than required by Florida Building Code – Plumbing.
- B. Mechanical Equipment Connections: Connect hot and cold water piping system to mechanical equipment as indicated, and comply with equipment manufacturer's installation instructions. Provide shutoff valve and union for each connection, provide drain valve on drain connection.

3.11 FIELD QUALITY CONTROL:
- A. Piping Tests: Test potable water piping in accordance with testing requirements of Division 15 Basic Mechanical Materials and Methods section "Pipes and Pipe Fittings".

3.12 ADJUSTING AND CLEANING:
- A. Cleaning, Flushing, and Inspecting: Clean, flush, and inspect potable water systems in accordance with requirements of Division 15 Basic Mechanical Materials and Methods section "Pipes and Pipe Fittings".
- B. Disinfection: Disinfect water service line in accordance with AWWA C601. Disinfect potable water system in accordance with Florida Building Code – Plumbing.

3.13 SPARE PARTS:
- A. Furnish to Owner, with receipt, one valve key for each key operated hydrant, bibb, or faucet installed.

END OF SECTION

SECTION 15412 - SOIL AND WASTE SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:
- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 00 Specification sections, apply to work of this section.
- B. Division 15 Basic Mechanical Materials and Methods sections apply to work of this section.

1.2 DESCRIPTION OF WORK:
- A. Extent of soil and waste systems work, is indicated on drawings and schedules, and by requirements of this section.
- B. Exterior sanitary sewer system is specified in other applicable specification sections, and is included as work of this section.
- C. Trenching and backfilling required in conjunction with underground building drain piping is specified in other applicable specification sections, and is included as work of this section.
- D. Refer to specification section "Flashing and Sheet Metal" for flashings required in conjunction with soil and waste systems; not work of this section.

1.3 QUALITY ASSURANCE:
- A. Manufacturer's Qualifications: Firms regularly engaged in manufacturer of soil and waste systems products of types, materials and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects with soil and waste systems work similar to that required for project.
- C. Codes and Standards:
  1. Plumbing Code Compliance: Comply with applicable portions of Florida Building Code –Plumbing pertaining to plumbing materials construction and installation of products.
  2. ANSI Compliance: Comply with applicable ANSI standards pertaining to materials, products, and installation of soil and waste systems.
  3. ASSE Compliance: Comply with applicable ASSE standards pertaining to materials, products, and installation of soil and waste systems.
  4. PDI Compliance: Comply with applicable PDI standards pertaining to products and installation of soil and waste systems.

1.4 SUBMITTALS:
- A. Product Data: Submit manufacturer's technical product data for soil and waste systems materials and products.
- B. Shop Drawings: Submit scaled layout drawings of soil and waste pipe and fittings including, but not necessarily limited to, pipe sizes, locations, elevations and slopes of horizontal runs, wall and floor penetrations, and connections. Show interface and spatial relationship between piping and proximate equipment.
- C. Record Drawings: At project closeout, submit record drawings of installed soil and waste systems, in accordance with requirements of Division 00.
- D. Maintenance Data: Submit maintenance data and parts lists for soil and waste systems materials and products. Include this data, product data, shop drawings, and record drawings in maintenance manual; in accordance with requirements of Division 00.

PART 2 - PRODUCTS

2.1 MATERIALS AND PRODUCTS:
- A. General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials used in soil and waste systems. Where more than one type of materials or products are indicated, selection is Installer's option.

2.2 BASIC IDENTIFICATION:
- A. General: Provide identification complying with Division 15 Basic Mechanical Materials and Methods section "Mechanical Identification", in accordance with the following listing:
  1. Above Ground Soil, Waste, and Vent Piping: Plastic pipe markers.
  2. Underground Building Drain Piping: Underground-type plastic line markers.

2.3 BASIC PIPES AND PIPE FITTINGS:
- A. General: Provide pipes and pipe fittings complying with Division 15 Basic Mechanical Materials and Methods section "Pipes and Pipe Fittings", in accordance with the following listing:
- B. Above Ground Conductor Piping:
  1. Single Story Buildings - Pipe Size 10" and Smaller: Polyvinyl chloride plastic pipe (PVC); Type DWV; PVC plastic type DWV socket-type fittings, solvent cement joints.
  2. Two Story Buildings - Pipe Size 10" and Smaller: Hubless cast-iron soil pipe; Service weight; Hubless cast-iron soil pipe fittings; hubless joints, or polyvinyl chloride plastic pipe (PVC); Type DWV; PVC plastic type DWV socket-type fittings, solvent cement joints.
- C. Underground Building Drain Piping:
  1. Pipe Size 8" and Smaller: Polyvinyl chloride plastic pipe (PVC); Type DWV; PVC plastic type DWV socket-type fittings, solvent cement joints.

2.4 BASIC PIPING SPECIALTIES:
- A. General: Provide piping specialties complying with Division 15 Basic Mechanical Materials and Methods section "Piping Specialties", in accordance with the following listing:
  1. Pipe Escutcheons.
  2. Mechanical Sleeve Seals.
  3. Pipe Sleeves.
  4. Sleeve Seals.

2.5 BASIC SUPPORTS AND ANCHORS:
- A. General: Provide supports and anchors complying with Division 15 Basic Mechanical Materials and Methods section "Supports and Anchors" in accordance with the following listing:
  1. Adjustable steel clevis hangers, steel pipe clamps, and pipe saddle supports for horizontal piping hangers and supports.
  2. Two-bolt riser clamps for vertical piping supports.
  3. Concrete inserts, C-clamps, and steel brackets for building attachments.

2.6 DRAINAGE PIPING PRODUCTS:
- A. General: Provide factory-fabricated drainage piping products of size and type indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements and governing regulations.
- B. Cleanout Plugs: Cast-bronze or brass, threads complying with ANSI B2.1, countersunk head.
- C. Floor Cleanouts: Cast-iron body and frame; cleanout plug; adjustable round top as follows:
  1. Nickel-Bronze Top: Manufactures standard cast unit of the pattern indicated.
     a. Pattern: Exposed flush type, standard non-slip scored or abrasive finish.
- D. Wall Cleanouts: Cast-iron body adaptable to pipe with cast-bronze or brass cleanout plug; stainless steel cover including screws.
- E. Flashing Flanges: Cast-iron watertight stack or wall sleeve with membrane flashing ring. Provide underdeck clamp and sleeve length as required.
- F. Vent Flashing Sleeves: Cast-iron caulking type roof coupling for cast-iron stacks, cast-iron threaded type roof coupling for steel stacks, and cast-bronze stack flashing sleeve for copper tubing.
- G. Manufacturer: Subject to compliance with requirements, provide drainage piping products of one of the following:
  1. Josam Mfg. Co.
  2. Smith (Jay R.) Co.
  3. Tyler Pipe; Subs. of Tyler Corp.
  4. Zurn Industries Inc.; Hydromechanics Div.

2.7 FLOOR DRAINS:
- A. General: Provide floor drains of size and types as indicated on drawings. Provide trap primer connections in all floor drains.

2.8 TRAP PRIMERS:
- A. General: Provide bronze trap primer valve with automatic vacuum breaker, complying with ASSE 1018, with 1/2" connections matching mating piping system.
- B. Manufacturer: Subject to compliance with requirements, provide trap primers of one of the following:
  1. Josam Mfg. Co.
  2. Precision Plumbing Products, Inc.
  3. Smith (Jay R.) Mfg. Co.
  4. Tyler Pipe; Subs. of Tyler Corp.
  5. Zurn Industries, Inc.; Hydromechanics Div.

PART 3 - EXECUTION

3.1 INSPECTION:
- A. Examine substrates and conditions under which soil and waste systems are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSTALLATION OF BASIC IDENTIFICATION:
- A. General: Install mechanical identification in accordance with Division 15 Basic Mechanical Materials and Methods section "Mechanical Identification".

3.3 INSTALLATION OF ABOVE GROUND PIPING:
- A. General: Install soil and waste piping in accordance with Division 15 Basic Mechanical Materials and Methods section "Pipes and Pipe Fittings", and with Florida Building Code –Plumbing.

3.4 INSTALLATION OF BUILDING DRAIN PIPING:
- A. General: Install underground building drains as indicated and in accordance with Florida Building Code – Plumbing. Lay underground building drains beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Install required gaskets in accordance with manufacturer's recommendations for use of lubricants, cements, and other special installation requirements. Clean interior of piping of dirt and other superfluous material as work progresses. Maintain swab or drag in line and pull past each joint as it is completed. Place plugs in ends of uncompleted piping at end of day or whenever work stops.
- B. Install soil and vent piping pitched to drain at minimum slope of 1/4" per foot (2%) for piping 3" and smaller, and 1/8" per foot (1%) for piping 4" and larger.

3.5 INSTALLATION OF PIPING SPECIALTIES:
- A. Install piping specialties in accordance with Division 15 Basic Mechanical Materials and Methods section "Piping Specialties".

3.6 INSTALLATION OF SUPPORTS AND ANCHORS:
- A. Install supports and anchors in accordance with Division 15 Basic Mechanical Materials and Methods section "Supports and Anchors".

3.7 INSTALLATION OF DRAINAGE PIPING PRODUCTS:
- A. Cleanouts: Install in above ground piping and building drain piping as indicated, as required by Florida Building Code – Plumbing, and at each change in direction of piping greater than 45°; at minimum intervals of 50' for piping 4" and smaller and 100' for larger piping; and at base of each vertical soil or waste stack. Install floor and wall cleanout covers for concealed piping, select type to match adjacent building finish.
- B. Flashing Flanges: Install flashing flange and clamping device with each stack and cleanout passing through waterproof membranes.
- C. Vent Flashing Sleeves: Install on stacks passing through roof, secure over stack flashing in accordance with manufacturer's instructions.

3.8 INSTALLATION OF FLOOR DRAINS:
- A. General: Install floor drains in accordance with manufacturer's written instructions and in locations indicated.
- B. Coordinate flashing work with work of waterproofing and adjoining substrate work.
- C. Coordinate with soil and waste piping as necessary to interface floor drains with drainage piping systems.
- D. Install floor drains at low points of surface areas to be drained, or as indicated. Set tops of drains flush with finished floor.
- E. Install drain flashing collar or flange so that no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes, where penetrated. Floor drains shall be suitable for the type of flooring.
- F. Position drains so that they are accessible and easy to maintain.

3.9 INSTALLATION OF TRAP PRIMERS:
- A. General: Install trap primers as indicated, and in accordance with manufacturer's installation instructions. Pitch piping toward drain trap, minimum of 1/8" per foot (1%). Adjust trap primer for proper flow.

3.10 EQUIPMENT CONNECTIONS:
- A. Piping Runouts to Fixtures: Provide soil and waste piping runouts to plumbing fixtures and drains, with approved trap, of sizes indicated; but in no case smaller than required by Florida Building Code – Plumbing.
- B. Locate piping runouts as close as possible to bottom of floor slab supporting fixtures or drains.

3.11 FIELD QUALITY CONTROL:
A. Piping Tests: Test soil and waste systems in accordance with requirements of Florida Building Code – Plumbing.

3.12 ADJUSTING AND CLEANING:
A. Clean, flush, and inspect soil and waste piping in accordance with requirements of Division 15 Basic Mechanical Materials and Methods section "Pipes and Pipe Fittings".

3.13 PROTECTION:
A. Protect drains during remainder of construction period, to avoid clogging with construction materials and debris, and to prevent damage from traffic and construction work.

END OF SECTION

SECTION 15420 - PLUMBING EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:
- A. Drawings and general provisions and Contract, including General and Supplementary Conditions and Division 00 Specifications sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:
- A. Extent of plumbing equipment work is indicated on drawings and provisions of this section, including schedules and equipment lists associated with either drawings or this section
- B. Types of plumbing equipment required for project include the following:
  1. Domestic water heaters.
     a. Electric water heaters.

1.3 QUALITY ASSURANCE:
- A. Manufacturers: Firms regularly engaged in manufacturer of plumbing equipment of type and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. UL and NEMA Compliance: Provide electric motors and electrical components required as part of plumbing equipment, which have been listed and labeled by Underwriters Laboratories and comply with NEMA standards.
- C. NEC Compliance: Comply with National Electrical Code (ANSI/NFPA 70) as applicable to installation and electrical connections of ancillary electrical components of plumbing equipment.
- D. NSF Labels: Provide water heaters which have been listed and labeled by National Sanitation Foundation.
- E. ASME Relief Valve Stamps: Provide water heaters with safety relief valves bearing ASME valve markings.
- F. Mineral Standards: Provide mineral products for water softeners, acceptable under state and local public health control regulations.

1.4 SUBMITTALS:
- A. Product Data: Submit manufacturer's plumbing equipment specifications, installation and start-up instructions, and capacity and ratings, with selection points clearly indicated.
- B. Wiring Diagrams: Submit ladder-type wiring diagrams for all components, clearly indicating all required field electrical connections.
- C. Maintenance Data: Submit maintenance data and parts lists for each item of plumbing equipment. Include "trouble-shooting" maintenance guides. Include this data in maintenance manual.

PART 2 - PRODUCTS

2.1 Residential Electric Water Heaters:
- A. General: Provide residential electric water heaters of size, capacity, and electrical characteristics as indicated on schedule. Comply with ANSI/ASHRAE/IES 90A for energy efficiency. Provide UL listing.
- B. Heater: Working pressure of 150 psi; magnesium anode rod; glass lining on internal surfaces exposed to water.
- C. Heating Elements: Low watt density with zinc plated copper sheath; double element, non-simultaneous operation.
- D. Safety Controls: Equip with high temperature cutoff for each element, factory wired.
- E. Jacket: Equip with full size control compartments with front panel opening. Insulate tank with vermin-proof glass fiber insulation. Provide outer steel jacket with baked enamel finish.
- F. Warranty: Furnish 5 year limited warranty for tank leakage.
- G. Accessories: Provide brass drain valve; 3/4" relief valve; cold water dip tube.
- H. Controls: Provide thermostat for each element, factory wired.
- I. Manufacturer: Subject to compliance with requirements, provide residential electric water heaters of one of the following:
  1. A.O. Smith, Consumer Products Div.
  2. Rheem Water Heater Div., City Investing Co.
  3. Ruud Water Heater Div., City Investing Co.
  4. State Industries.
  5. Viking Superior Corp.

PART 3 - EXECUTION

3.1 INSTALLATION OF Electric Water Heaters:

A. General: Install electric water heaters as indicated, in accordance with manufacturer's installation instructions, and in compliance with applicable codes.

B. Support: Set units on concrete pads, orient so controls and devices needing service and maintenance have adequate access. Level and plumb unit.

C. Electrical Supply: Furnish wiring diagram to Electrical Installer. Refer to Division 16 for wiring of units; not work of this section.

D. Piping: Connect hot and cold water piping to units with shutoff valves and unions. Connect recirculating water line to unit with shutoff valve, check valve, and union.

E. Start-up: Start-up, test, and adjust electric water heaters in accordance with manufacturer's start-up instructions. Check and calibrate controls.

END OF SECTION

SECTION 15440 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:
- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 00 Specification sections, apply to work of this section.
- B. Division 15 Basic Mechanical Materials and Methods sections apply to work of this section.

1.2 DESCRIPTION OF WORK:
- A. Extent of plumbing fixtures work required by this section is indicated on drawings and schedules, and by requirements of this section.
- B. Types of plumbing fixtures specified in this section include the following:
  1. Water closets.
  2. Urinals.
  3. Lavatories.
  4. Water Fountains.
  5. Service sinks.
  6. Stainless steel sinks.
- C. Refer to Division 15 sections for potable water systems used in conjunction with plumbing fixtures; not work of this section.
- D. Refer to Division 15 sections for soil and waste systems used in conjunction with plumbing fixtures; not work of this section.

1.3 QUALITY ASSURANCE:
- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of plumbing fixtures of type, style and configuration required, whose products have been in satisfactory use in similar service for not less than 3 years.
- B. Codes and Standards:
  1. Plumbing Fixture Standards: Comply with applicable portions of Florida Building Code -Plumbing pertaining to materials and installation of plumbing fixtures.
  2. ANSI Standards: Comply with applicable ANSI standards pertaining to plumbing fixtures and systems.
  3. PDI Compliance: Comply with standards established by PDI pertaining to plumbing fixture supports.
  4. Federal Standards: Comply with applicable FS WW-P-541/-Series sections pertaining to plumbing fixtures.
  5. ANSI Compliance: Construct and install barrier-free plumbing fixtures in accordance with Florida Building Code.

1.4 SUBMITTALS:
- A. Product Data: Submit manufacturer's technical product data, including rated capacities of selected model clearly indicated, furnished specialties and accessories; and installation instructions.
- B. Shop Drawings: Submit manufacturer's assembly-type shop drawings indicating dimensions, roughing-in requirements, required clearances, and methods of assembly of components and anchorages.
- C. Maintenance Data: Submit maintenance data and parts lists for each type of plumbing fixture and accessory; including "trouble-shooting" maintenance guide. Include this data, product data, and shop drawings in maintenance manual; in accordance with requirements of Division 00.

1.5 DELIVERY, STORAGE, AND HANDLING:
- A. Deliver plumbing fixtures individually wrapped in factory-fabricated containers.
- B. Handle plumbing fixtures carefully to prevent breakage, chipping and scoring fixture finish. Do not install damaged plumbing fixtures; replace and return damaged units to equipment manufacturer.

PART 2 - PRODUCTS

2.1 PLUMBING FIXTURES:
- A. General: Provide factory-fabricated fixtures of type, style, and material indicated. For each type fixture, provide fixture manufacturer's standard trim, carrier, seats, and valves as indicated by their published product information; either as designed and constructed, or as recommended by manufacturer, and as required for complete installation. Where more than one type is indicated, selection is Installer's option; but, all fixtures of same type must be furnished by single manufacturer. Where type is not otherwise indicated, provide fixtures complying with governing regulations.

2.2 MATERIALS:

A. General: Unless otherwise specified, comply with applicable Federal Specification WW-P-541/-Series sections pertaining to plumbing fixtures, fittings, trim, metals, and finishes. Comply with requirements of WW-P-541/-specification relative to quality of ware, glazing, enamel, composition and finish of metals, air gaps, and vacuum breakers, even though some plumbing fixtures specified in this section are not described in WW-P-541/-specification.

B. Provide materials which have been selected for their surface flatness and smoothness. Exposed surfaces which exhibit pitting, seam marks, roller marks, foundry sand holes, stains, discoloration, or other surface imperfections on finished units are not acceptable.

C. Where fittings, trim and accessories are exposed or semi-exposed provide bright chrome-plated or polished stainless steel units. Provide copper or brass where not exposed.

D. Stainless Steel Sheets: ASTM A 167, Type 302/304, hardest workable temper.

E. Finish: No. 4, bright, directional polish on exposed surfaces.

F. Vitreous China: High quality, free from fire cracks, spots, blisters, pinholes and specks; glaze exposed surfaces, and test for crazing resistance in accordance with ASTM C 554.

G. Synthetic Stone: High quality, free from defects, glaze on exposed surfaces, stain resistant.

2.3 PLUMBING FITTINGS, TRIM, AND ACCESSORIES:

A. Water Outlets: At locations where water is supplied (by manual, automatic or remote control), provide commercial quality faucets, valves, or dispensing devices, of type and size indicated, and as required to operate as indicated. Include manual shutoff valves and connecting stem pipes to permit outlet servicing without shut-down of water supply piping systems.

B. Vacuum Breakers: Provide with flush valves where required by governing regulations, including locations where water outlets are equipped for hose attachment.

C. P-Traps: Include removable P-traps where drains are indicated for direct connection to drainage system.

D. Carriers: Provide cast-iron supports for fixtures of either graphitic gray iron, ductile iron, or malleable iron as indicated.

E. Fixture Bolt Caps: Provide manufacturer's standard exposed fixture bolt caps finished to match fixture finish.

F. Escutcheons: Where fixture supplies and drains penetrate walls in exposed locations, provide chrome-plated cast-brass escutcheons with set screw.

G. Aerators: Provide aerators of types approved by Health Departments having jurisdiction.

H. Comply with additional fixture requirements contained in fixture schedule attached to this section.

I. Manufacturer: Subject to compliance with requirements, provide plumbing fixtures of one of the following:

1. Plumbing Fixtures:
   a. American Standard: U.S. Plumbing Products.
   b. Briggs
   c. Eljer Plumbingware Div.; Household International Co.
   d. Kohler Co.
2. Plumbing Trim:
   a. American Standard; U.S. Plumbing Products.
   b. Chicago Faucet Co.
   c. Delta Faucet Co.; Div. of Masco Corp.
   d. Eljer Plumbingware Div.; Household International Co.
   e. Kohler Co.
   f. McGuire
   g. Speakman Co.
   h. T & S Brass and Bronze Works, Inc.
   i. Woodford
3. Flush Valves:
   a. Sloan Valve Co.
4. Fixture Seats:
   a. Bemis Mfg. Co.
   b. Beneke Corp.
   c. Church
   d. Olsonite Corp.; Olsonite Seats.
5. Water Fountains:
   a. Elkay Mfg. Co.
   b. Halsey Taylor Div.; Household International Co.
   c. Haws Drinking Faucet Co.
   d. Western Drinking Fountains; Div. of Sunroc Corp.
   e. White-Westinghouse Water Coolers.
6. Service Sinks:

a. American Standard; U.S. Plumbing Products.
b. Eljer Plumbingware Div;.; Household International Co.
c. Fiat Products.
d. Kohler Co.

7. Stainless Steel Sinks:
   a. American Standard; U.S. Plumbing Products
   b. Elkay Mfg. Co.
   c. Just Mfg. Co.
8. Fixture Carriers:
   a. Josam Mfg. Co.
   b. Kohler Co.
   c. Smith (Jay R.)
   d. Tyler Pipe.
   e. Zurn Industries, Inc.; Hydromechanics Div.

PART 3 - EXECUTION

3.1 INSPECTION:

A. Examine roughing-in work of potable water and waste piping systems to verify actual locations of piping connections prior to installing fixtures. Also examine floors and substrates, and conditions under which fixture work is to be accomplished. Correct any incorrect locations of piping, and other unsatisfactory conditions for installation of plumbing fixtures. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSTALLATION OF PLUMBING FIXTURES:

A. General: Install plumbing fixtures of types indicated where shown and at indicated heights; in accordance with fixture manufacturer's written instructions, roughing-in drawings, and with recognized industry practices. Ensure that plumbing fixtures comply with requirements and serve intended purposes. Comply with applicable requirements of Florida Building Code -Plumbing pertaining to installation of plumbing fixtures.

B. Fasten plumbing fixtures securely to indicated supports or building structure; and ensure that fixtures are level and plumb. Secure plumbing supplies behind or within wall construction so as to be rigid, and not subject to pull or push movement.

C. Protect installed fixtures from damage during remainder of construction period.

3.3 FIELD QUALITY CONTROL:

A. Upon completion of installation of plumbing fixtures and after units are water pressurized, test fixtures to demonstrate capability and compliance with requirements. When possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units and proceed with retesting.

B. Inspect each installed unit for damage to finish. If feasible, restore and match finish to original at site; otherwise, remove fixture and replace with new unit. Feasibility and match to be judged by Architect/Engineer. Remove cracked or dented units and replace with new units.

3.4 ADJUSTING AND CLEANING:

A. Clean plumbing fixtures, trim, and strainers of dirt and debris upon completion of installation.

B. Adjust water pressure at drinking fountains, faucets, shower valves, and flush valves to provide proper flow stream and specified gpm.

C. Adjust or replace washers to prevent leaks at faucets and stops.

3.5 EXTRA STOCK:

A. General: Furnish special wrenches and other devices necessary for servicing plumbing fixtures and trim to Owner with receipt. Furnish one device for every 10 units.

END OF SECTION

SECTION 15841 - DUCTWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:
- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 00 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK:
- A. Extent of low and medium pressure ductwork is indicated on drawings and in schedules, and by requirements of this section.
- B. Definition of Pressure Classifications:
  1. Low Pressure/Low Velocity: Less than or equal to 2 inch water gauge (WG) positive or negative static pressure and velocities less than 2,500 FPM.
  2. Medium Pressure/High Velocity: 2 inch WG to 9 inch water gauge (WG) positive or negative static pressure and velocities greater than 2,500 FPM.
- C. Types of ductwork required for project include the following:
  1. Heating supply and return air systems.
  2. Air-conditioning supply and return air systems.
  3. Fresh air supply systems.
  4. Mechanical exhaust systems.
  5. Air relief systems.

1.3 QUALITY ASSURANCE:
- A. SMACNA Standards: Comply with SMACNA "Duct Construction Standards".
- B. NFPA Compliance: Comply with the following NFPA Standards:
  1. NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems," except as indicated otherwise.
  2. NFPA 96, "Standard for the Installation of Equipment for the Removal of Smoke and Grease-Laden Vapors for Commercial Cooking Equipment," Chapter 3, "Duct System," for kitchen hood duct systems, except as indicated otherwise.

1.4 SUBMITTALS:
- A. General: Submit the following in accordance with Conditions of Contract and Division 00 Specification Sections.
- B. Product data including details of construction relative to materials, dimensions of individual components, profiles, and finishes for the following items:
  1. Sealing Materials.
  2. Fire-Stopping Materials.
- C. Duct Fabrication Shop Drawings: Submit dimensioned layouts of ductwork, showing both the accurately scaled ductwork (1/4”=1’-0” minimum on 36x24 sheets) drawings and its relation to space enclosure. Show modifications of indicated requirements, made to conform to local shop practice, and how those modifications ensure that free area, materials, and rigidity are not reduced. Show locations of smoke detectors. Coordinate with electrical and plumbing contractors and show location of electrical panels and floor drains.
- D. Welding certificates including welding procedures specifications, welding procedures qualifications test records, and welders' qualifications test records complying with requirements specified in Section 15010.
- E. Record drawings including duct systems routing, fittings details, reinforcing, support, and installed accessories and devices, in accordance with Division 15 Section "Basic Mechanical Requirements" and Division 00.
- F. Maintenance data for volume control devices, fire dampers, and smoke dampers, in accordance with Division 15 Section "Basic Mechanical Requirements" and Division 00.

1.5 QUALITY ASSURANCE
- A. NFPA Compliance: Comply with the following NFPA Standards:
  1. NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems," except as indicated otherwise.
  2. NFPA 96, "Standard for the Installation of Equipment for the Removal of Smoke and Grease-Laden Vapors for Commercial Cooking Equipment," Chapter 3, "Duct System," for kitchen hood duct systems, except as indicated otherwise.

1.6 DELIVERY, STORAGE, AND HANDLING:
A. Protect shop-fabricated and factory-fabricated ductwork, accessories and purchased products from damage during shipping, storage and handling. Prevent end damage and prevent dirt and moisture from entering ducts and fittings.
B. Where possible, store ductwork inside and protect from weather. Where necessary to store outside, store above grade and enclose with waterproof wrapping.

PART 2 - PRODUCTS

2.1 SHEET METAL MATERIALS
A. Sheet Metal, General: Provide sheet metal in thicknesses indicated, packaged and marked as specified in ASTM A 700.
B. Galvanized Sheet Steel: Lock-forming quality, ASTM A 527, Coating Designation G 90. Provide mill phosphatized finish for exposed surfaces of ducts exposed to view.
C. Carbon Steel Sheets: ASTM A 366, cold-rolled sheets, commercial quality, with oiled, exposed matte finish.
D. Stainless Steel: ASTM A 480, Type 316, sheet form, with no. 4 finish on exposed surface for ducts exposed to view; Type 304, sheet form, with no. 1 finish for concealed ducts.
E. Reinforcement Shapes and Plates: Unless otherwise indicated, provide galvanized steel reinforcing where installed on galvanized sheet metal ducts. For aluminum and stainless steel ducts provide reinforcing of compatible materials.
F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for 36-inch length or less; 3/8-inch minimum diameter for lengths longer than 36 inches.
G. Exposed Ductwork Materials: Where ductwork is indicated to be exposed to view in occupied spaces, provide materials, which are free from visual imperfections including pitting, seam marks, roller marks, oil canning, stains and discolorations, and other imperfections, including those which would impair painting.

2.2 SEALING MATERIALS
A. Joint and Seam Sealant: One-part, non-sag, solvent-release-curing, polymerized butyl sealant complying with FSTT-S-001657, Type I; formulated with a minimum of 75% solids.
B. Flanged Joint Mastics: One-part, acid-curing, silicone elastomeric joint sealants, complying with ASTM C 920, Type S, Grade NS, Class 25, Use O.

2.3 FIRE-STOPPING
A. Fire-Resistant Sealant: Provide one-part elastomeric sealant formulated for use in a through-penetration fire-stop system for filling openings around duct penetrations through walls and floors, having fire-resistance ratings indicated as established by testing identical assemblies per ASTM E 814 by Underwriters Laboratory, Inc. or other testing and inspecting agency acceptable to authorities having jurisdiction.
B. Products: Subject to compliance with requirements, provide one of the following:
1. "Dow Corning Fire Stop Foam", Dow Corning Corp.
2. "Pensil 851", General Electric Co.
3. "Dow Corning Fire Stop Sealant", Dow Corning Corp.
4. "3M Fire Barrier Caulk CP-25", Electrical products Div./3M
5. "RTV 7403", General Electric Co.
6. "Fyre Putty", Standard Oil Engineered Materials Co.

2.4 RECTANGULAR DUCT FABRICATION
A. General: Except as otherwise indicated, fabricate rectangular ducts with galvanized sheet steel, in accordance with SMACNA "HVAC Duct Construction Standards," Tables 1-3 through 1-19, including their associated details. Conform to the requirements in the referenced standard for metal thickness, reinforcing types and intervals, tie rod applications, and joint types and intervals.
1. Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure classification.
2. Provide materials that are free from visual imperfections such as pitting, seam marks, roller marks, stains, and discolorations.
B. Static Pressure Classifications: Except where otherwise indicated, construct duct systems to the following pressure classifications:
1. Supply Ducts: +4” water gauge.
2. Return Ducts: -4” water gauge.
3. Outside Air Ducts: -2” water gauge.
4. Relief Ducts: ±3” water gauge.
5. Exhaust Ducts: ±3” water gauge.
6. Transfer Ducts (without fan): ±1” water gauge.
7. Supply Ducts Downstream of VAV Terminals: +1” water gauge.

C. Crossbreaking or Cross Beading: Crossbreak or bead duct sides that are 19 inches and larger and are 20 gage or less, with more than 10 sq. ft. of unbraced panel area, as indicated in SMACNA "HVAC Duct Construction Standard."

2.5 RECTANGULAR DUCT FITTINGS

A. Fabricate elbows, transitions, offsets, branch connections, and other duct construction in accordance with SMACNA "HVAC Metal Duct Construction Standard," 2005 Edition, Figures 2-1 through 2-10.

2.6 ROUND DUCT FABRICATION

A. General: "Basic Round Diameter" as used in this article is the diameter of the size of round duct that has a circumference equal to the perimeter of a given sized of flat oval duct. Except where interrupted by fittings, provide round and flat oval ducts in lengths not less than 12 feet.
B. Round Ducts: Provide round supply and return ducts and fittings as indicated with spiral lockseam construction, except for diameters greater than 72 inches. Use longitudinal butt-welded seams. Comply with SMACNA "HVAC Duct Construction Standards," Table 3-2 for galvanized steel gages.

2.7 ROUND AND SUPPLY AND EXHAUST FITTINGS FABRICATION

A. 90-Degree Tees and Laterals and Conical Tees: Fabricate to conform to SMACNA "HVAC Duct Construction Standards," 2005 Edition, Figures 3-4 and 3-5 and with metal thicknesses specified for longitudinal seam straight duct.
B. Diverging-Flow Fittings: Fabricate with a reduced entrance to branch taps with no excess material projecting from the body onto branch tap entrance.
C. Elbows: Fabricate in die-formed, gored, pleated, or mitered construction. Fabricate the bend radius of die-formed, gored, and pleated elbows 1.5 times the elbow diameter. Unless elbow construction type is indicated, provide elbows meeting the following requirements:
    1. Mitered Elbows: Fabricate mitered elbows with welded construction in gages specified below.
        a. Mitered Elbows Radius and Number of Pieces: Unless otherwise indicated, construct elbow to comply with SMACNA "HVAC Duct Construction Standards," Table 3-1.
        b. Round Mitered Elbows: Solid welded and with metal thickness listed below for pressure classes from 2 inches to 10 inches:

            3 to 14 inches: 24 gage.
            15 to 26 inches: 22 gage.
            27 to 50 inches: 20 gage.
            52 to 60 inches: 18 gage.
            62 to 84 inches: 16 gage.

        c. 90-degree, 2-piece, mitered elbows: use only for supply systems, or exhaust systems for material handling classes A and B; and only where space restrictions do not permit the use of 1.5 bend radius elbows. Fabricate with a single-thickness turning vanes.
    2. Round Elbows - 8 Inches and smaller: die-formed elbows for 45- and 90-degree elbows and pleated elbows for 30, 45, 60, and 90 degrees only. Fabricate nonstandard bend angle configurations or 2-inch-diameter (e.g. 3-1/2- and 4-1/2-inch) elbows with gored construction.
    3. Round Elbows - 9 Through 14 Inches: gored or pleated elbows for 30, 45, 60, and 90 degrees, except where space restrictions require a mitered elbow. Fabricate nonstandard bend angle configurations or 2-inch-diameter (e.g. 9-1/2- and 10-1/2-inch) elbows with gored construction.
    4. Round Elbows – Larger than 14 inches and all flat oval elbows: Gored elbows, except where space restrictions require a mitered elbow.
    5. Die-formed elbows for sizes through 8 inches and all pressures: 20 gage with 2-piece welded construction.
    6. Round gored elbows gages: same as for non-elbow fittings specified above.
    7. Pleated elbows sizes through 14 inches and pressures through 10 inches: 26 gage.

2.8 Double-Wall (Insulated) Ducts: Fabricate double-wall insulated ducts with an outer shell, insulation, and an inner liner as specified below. Dimensions indicated on internally insulated ducts are nominal inside dimensions.
    1. Thermal Conductivity: 0.27 Btu/square foot/degree F./inch thickness at 75°F mean temperature.
    2. Outer Shell: Base outer shell gauge on actual outer shell dimensions. Provide outer shell lengths 2" longer than inner shell and insulation, and in gauges specified for single-wall duct.
    3. Insulation: unless otherwise indicated, provide 1-1/2" thick fiberglass insulation. Provide insulation ends where internally insulated duct connects to single-wall duct or noninsulated components. The insulation end shall terminate the insulation and reduce the outer shell diameter to the inner liner diameter.
        a. Where double-wall duct is exposed to ambient conditions such as in exterior soffits, provide 1” thick fiberglass insulation in appropriately sized outer shell and paint the outer shell with a thermo-dynamically ceramic thermal barrier equivalent to SUPERTHERM with a minimum thickness of 7 dry mils yielding a thermal conductivity of 0.21 K for the paint.

4. Solid Inner Liner: Construct round and flat oval inner liners with solid sheet metal of the gauges listed below. For flat oval ducts, the diameter indicated in the table below is the "basic round diameter."
   a. 3 to 8 inches: 28 gauge with standard spiral construction.
   b. 9 to 42 inches: 28 gauge with single-rib spiral construction.
   c. 44 to 60 inches: 26 gauge with single-rib spiral construction.
   d. 62 to 88 inches: 22 gauge with standard spiral construction.
5. Maintain concentricity of liner to outer shell by mechanical means. Protect insulation from discoloration by mechanical means.

2.9 FACTORY-FABRICATED DUCTWORK:
A. General:
   1. Double-wall ductwork shall be factory-fabricated.
   2. Single wall ductwork, at installer's option, may be factory-fabricated duct and fittings, in lieu of shop-fabricated duct and fittings.
B. Material: Galvanized sheet steel complying with ANSI/ASTM A 527, lockforming quality, with ANSI/ASTM A 525, G90 zinc coating, mill phosphatized.
C. Gage: 28 ga. minimum for round and oval ducts and fittings, 4" through 24" diameter.
D. Elbows: One-piece construction for 90° and 45° elbows 14" and smaller. Provide multiple gore construction for larger diameters with standing seam circumferential joint.
E. Divided Flow Fittings: 90° tees, constructed with saddle tap spot-welded and bonded to duct fitting body.
F. Manufacturer: Subject to compliance with requirements, provide factory-fabricated ductwork of one of the following:
   1. United Sheet Metal Div. United McGill Corp.

2.10 FLEXIBLE DUCTS
A. General: Comply with UL 181, Class 1.
B. Flexible Ducts - Insulated: Factory-fabricated, insulated, round duct, with an outer jacket enclosing glass fiber (1" thick in conditioned areas, 1-1/2" thick in non-conditioned spaces) insulation around a continuous inner liner.
   1. Reinforcement: Steel-wire helix encapsulated in the inner liner.
   2. Outer Jacket: Glass-reinforced, silver mylar with a continuous hanging tab, integral fiber glass tape, and nylon hanging cord.
   3. Inner Liner: Polyethylene film.
C. Manufacturer: Subject to compliance with requirements, provide Flexible Duct Connectors of one of the following:
   1. Clevaflex
   2. Genflex type
   3. Wiremold
   4. Flexmaster

PART 3 - EXECUTION

3.1 DUCT INSTALLATION, GENERAL
A. Flexible duct runs shall be supported every 3 feet with minimum 1/2-inch strap. Maximum permissible sag is 2 inch per foot.
B. Flexible duct connections shall include three wraps of approved tape and stainless steel draw band. Insulation jacket shall be sealed with three wraps of approved UL 181B tape.
C. Duct System Pressure Class: Construct and install each duct system for the specific duct pressure classification indicated.
D. Install ducts with the fewest possible joints.
E. Use fabricated fittings for all changes in directions, changes in size and shape, and connections.
F. Install couplings tight to duct wall surface with projections into duct at connections kept to a minimum.
G. Locate ducts, except as otherwise indicated, vertically and horizontally, parallel and perpendicular to building lines; avoid diagonal runs. Install duct systems in shortest route that does not obstruct usable space or block access for servicing building and its equipment.
H. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
I. Provide clearance of 1 inch where furring is shown for enclosure or concealment of ducts, plus allowance for insulation thickness, if any.
J. Install insulated ducts with 1-inch clearance outside of insulation.

K. Conceal ducts from view in finished and occupied spaces by locating in mechanical shafts, hollow wall construction, or above suspended ceilings. Do not encase horizontal runs in solid partitions, except as specifically shown.
L. Coordinate layout with suspended ceiling and lighting layouts and similar finished work.
M. Electrical Equipment Spaces: Route ductwork to avoid passing through transformer vaults and electrical equipment spaces and enclosures.
N. Non-Fire-Rated Partition Penetrations: Where ducts pass interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same gage as duct. Overlap opening on four sides by at least 1-1/2 inches.

3.2 SEAM AND JOINT SEALING
A. General: Seal duct seams and joints as follows:
1. Pressure Classifications Greater Than 3 Inches Water Gage: All transverse joints, longitudinal seams, and duct penetrations.
2. Pressure Classification 2 and 3 Inches Water Gage: All transverse joints and longitudinal seams.
3. Pressure Classification Less than 2 Inches Water Gage: Transverse joints only.
4. Seal externally insulated ducts prior to insulation installation.

3.3 HANGING AND SUPPORTING
A. Install rigid round, rectangular, and flat oval metal duct with support systems indicated in SMACNA "HVAC Duct Construction Standards," Tables 4-1 through 4-3 and Figures 4-1 through 4-8.
B. Support horizontal ducts within 2 feet of each elbow and within 4 feet of each branch intersection.
C. Support vertical ducts at a maximum interval of 16 feet and at each floor.
D. Upper attachments to structures shall have an allowable load not exceeding 1/4 of the failure (proof test) load but are not limited to the specific methods indicated.
E. Install concrete insert prior to placing concrete.
F. Install powder actuated concrete fasteners after concrete is placed and completely cured.

3.4 CONNECTIONS
A. Equipment Connections: Connect equipment with flexible connectors in accordance with Division 15 Section "Duct Accessories."
B. Branch Connections: Comply with SMACNA "HVAC Duct Construction Standards," Figures 2-7 and 2-8.
C. Outlet and Inlet Connections: Comply with SMACNA "HVAC Duct Construction Standards," Figures 2-16 through 2-18.
D. Terminal Units Connections: Comply with SMACNA "HVAC Duct Construction Standards," Figure 2-19.

3.5 DUCT LEAKAGE TEST
A. Maximum Allowable Leakage: As described specification 230593.3.1.D.
B. Remake leaking joints as required and apply sealants to achieve specified maximum allowable leakage.
C. Leakage test shall be witnessed by the Owner at their discretion.

3.6 CLEANING AND PROTECTION:
A. Clean ductwork internally, unit-by-unit as it is installed, of dust and debris. Clean external surfaces of foreign substances which might cause corrosive deterioration of metal or, where ductwork is to be painted, might interfere with painting or cause paint deterioration.
B. Strip protective paper from stainless ductwork surfaces, and repair finish wherever it has been damaged.
C. Temporary Closure: At ends of ducts which are not connected to equipment or air distribution devices at time of ductwork installation, provide temporary closure of polyethylene film or other covering which will prevent entrance of dust and debris until time connections are to be completed.

3.7 BALANCING:
A. Refer to Division 15 section "Testing and Balancing" for air distribution balancing; not work of this section. Make repairs that become apparent during the balancing process.

END OF SECTION

SECTION 15870 - POWER AND GRAVITY VENTILATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:
- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 00 Specification sections, apply to work of this section.
- B. Division 15 Basic Mechanical Materials and Methods sections apply to work of this section.

1.2 DESCRIPTION OF WORK:
- A. Extent of power and gravity ventilator work required by this section is indicated on drawings and schedules, and by requirements of this section.
- B. Types of power and gravity ventilators specified in this section include the following:
  1. Power ventilators.
     a. Centrifugal roof ventilators.
  2. Ceiling ventilators.
     a. Bathroom exhausters.
  3. Prefabricated roof curbs.
- C. Refer to Division-7 sections for installation of prefabricated roof curbs; not work of this section.
- D. Refer to Division 15 section "Testing, Adjusting, and Balancing" for balancing of power and gravity ventilators; not work of this section.
- E. Refer to Division 15 temperature control systems sections for control work required in conjunction with power and gravity ventilators; not work of this section.
- F. Refer to Division 16 sections for the following work; not work of this section.
  1. Power supply wiring from power source to power connection on ventilators. Include starters, disconnects, and required electrical devices, except where specified as furnished, or factory-installed, by manufacturer.
  2. Interlock wiring between ventilators; and between ventilators and field-installed control devices.
  3. Interlock wiring specified as factory-installed is work of this section.
- G. Provide the following electrical work as work of this section, complying with requirements of Division 16 sections:
  1. Control wiring between field-installed controls, indicating devices, and ventilators.
  2. Control wiring specified as work of Division 15 for Automatic Temperature Controls is work of that section.

1.3 QUALITY ASSURANCE:
- A. Manufacturer's Qualifications: Firms regularly engaged in manufacturer of power and gravity ventilators, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 3 years.

1.4 CODES AND STANDARDS:
  1. AMCA Compliance: Provide power ventilators which have been tested and rated in accordance with AMCA standards, and bear AMCA Certified Ratings Seal.
  2. UL Compliance: Provide power ventilators which are listed by UL and have UL label affixed.
  3. NEMA Compliance: Provide motors and electrical accessories complying with NEMA standards.

1.5 SUBMITTALS:
- A. Product Data: Submit manufacturer's technical data for power and gravity ventilators, including specifications, capacity ratings, dimensions, weights, materials, accessories furnished, and installation instructions.
- B. Shop Drawings: Submit assembly-type shop drawings showing unit dimensions, construction details, methods of assembly of components, and field connection details.
- C. Wiring Diagrams: Submit manufacturer's electrical requirements for power supply wiring to power ventilators. Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.
- D. Maintenance Data: Submit maintenance data and parts list for each type of power and gravity ventilator, accessory, and control. Include this data, product data, shop drawings, and wiring diagrams in maintenance manual; in accordance with requirements of Division 00.

1.6 DELIVERY, STORAGE, AND HANDLING:
- A. Handle units and components carefully to prevent damage, breaking, denting, and scoring. Do not install damaged units or components; replace with new.

B. Store units and components in clean dry place. Protect from weather, dirt, fumes, water, construction debris, and physical damage.
C. Comply with manufacturer's rigging and installation instructions for unloading units, and moving units to final location for installation.

PART 2 - PRODUCTS

2.1 POWER VENTILATORS:
A. General: Except as otherwise indicated, provide standard preabricated power ventilator units of type and size indicated, modified as necessary to comply with requirements, and as required for complete installation.
B. Centrifugal Roof Ventilators: Provide centrifugal roof type, curb mounted, power ventilators of type, size, and capacity as scheduled, and as specified herein.
C. Type: Centrifugal fan, direct or belt driven as scheduled. Provide aluminum, galvanized steel, or fiberglass weatherproof housings as scheduled. Provide square base to suit roof curb. Provide permanent split-capacitor type motor for direct driven fans; capacitor-start, induction-run type motor for belt driven fans.
1. Housing Design: Hooded dome type.
D. Electrical: Provide factory-wired non-fusible type disconnect switch at motor in fan housing. Provide thermal overload protection in fan motor. Provide conduit chase within unit for electrical connection.
E. Bird Screens: Provide removable bird screens, 1/2" mesh, 16-ga aluminum or brass wire.
F. Dampers: Provide gravity-actuated louvered dampers in curb bases.
G. Refer to Division 15 automatic temperature control sections for damper motor and control sequence; not work of this section.
H. Manufacturer: Subject to compliance with requirements, provide centrifugal roof ventilators of one of the following:
1. Loren Cook Co.
2. Greenheck Fan Co.
3. Penn Ventilator Co.

2.2 CEILING VENTILATORS:
A. Centrifugal Ceiling Exhausters: Provide centrifugal ceiling exhausters, designed for ceiling or wall mounting, of type, size and capacity as scheduled.
B. Provide AMCA Certified Ratings Seal.
C. Type: Provide galvanized steel housing lined with acoustical insulation, adaptable for ceiling or wall installation. Provide centrifugal fan wheels mounted on motor shaft with fan shrouds, all removable for service. Provide integral backdraft damper fan discharge.
D. Grille: Provide stainless steel louvered grille with flange on intake with thumbscrew attachment to fan housing.
E. Motor: Provide permanent split-capacitor motor, permanently lubricated, with grounded cord and plug.
F. Electrical: Provide junction box for electrical connection on housing, and receptacle for motor plug-in.
G. Accessories: Provide manufacturer's standard roof jack, wall cap, and transition fittings as indicated on drawings or schedules.
H. Manufacturer: Subject to compliance with requirements, provide centrifugal ceiling exhausters of one of the following:
1. Acme Engineering and Mfg. Corp.
2. Cook Co., Loren.
3. Greenheck Fan Co.
4. Penn Ventilator Co., Inc.

2.3 PREFABRICATED ROOF CURBS:
A. General: Provide manufacturer's standard shop-fabricated units, modified if necessary to comply with requirements.
B. Fabricate structural framing for units of structural quality sheet steel (ASTM A 570, Grade 40), formed to profiles indicated or, if not indicated, to manufacturer's standard profiles for coordination with roofing, insulation and deck construction. Include 45^{o} cant strips and deck flanges with offsets to accommodate roof insulation. Weld corners and seams to form watertight units.
C. Fabricate units from zinc-coated steel, ASTM A 446, Grade C, designation G90 hot-dip coating, mill phosphatized. Clean and paint with rust-inhibitive metal primer paint, of type recommended by manufacturer, 2.0 mils dry film thickness.
D. Reinforce continuous runs of over 3'-0" length, by inserting welded stiffeners of heavy gage with flanges as required to provide sufficient rigidity and strength to withstand maximum lateral forces in addition to superimposed vertical loads.
E. Sloping Roof Decks: For deck slopes of 1/4" per foot and more, fabricate support units to form level top edge.

F. Gage and Height: Fabricate units of metal gage and at height above roof surface as indicated.
G. Where gage or height are not indicated, fabricate units of 14-ga metal, and nominal height of 14".
H. Provide treated wood nailer, not less than 1-5/8" thick and of width indicated, but not less than width of support wall assembly. Anchor nailer securely to top of metal frame unit.
I. Provide lumber pressure treated with water-borne preservatives for "above ground" use, complying with AWPB LP-2.
J. Insulate units inside structural support wall with rigid glass fiber insulation board of approximately 3-lb. density and 1-1/2" minimum thickness, except as otherwise indicated.
K. Provide support liners where shown, formed of 22-ga galvanized sheet metal, mill phosphatized, flanged at lower edges.
L. Extend support liners through deck construction to coordinate with ductwork below as indicated.
M. Provide burglar-proof grille in curb units for roof openings of more than 1'-0" width. Fabricate grille of 3/4" diameter hardened steel bars, spaced 6" o.c. in one direction and 12" o.c. in other direction. Weld ends of bars to curb walls, and weld bars at intersections. Clean and paint with rust-inhibitive metal primer.
N. Manufacturer: Subject to compliance with requirements, provide prefabricated roof curbs of one of the following:
   1. Custom Curb, Inc.
   2. Pate Co.
   3. S & L Manufacturing Co.
   4. ThyCurb Div.; Thybar Corp.

PART 3 - EXECUTION

3.1 INSPECTION:
A. General: Examine areas and conditions under which power and gravity ventilators are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF POWER AND GRAVITY VENTILATORS:
A. General: Except as otherwise indicated or specified, install ventilators in accordance with manufacturer's installation instructions and recognized industry practices to insure that ventilators serve their intended function.
B. Coordinate ventilator work with work of roofing, walls, and ceilings, as necessary for proper interfacing.
C. Ductwork: Refer to Division 15 section "Ductwork". Connect ducts to ventilators in accordance with manufacturer's installation instructions.
   1. Provide access door in duct below ventilator to service damper.
D. Roof Curbs: Furnish roof curbs to roofing Installer for installation.
E. Electrical Wiring: Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer.
F. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division 16 sections. Verify proper rotation direction of fan wheels. Do not proceed with equipment start-up until wiring installation is acceptable to equipment installer.
G. Remove shipping bolts and temporary supports within ventilators. Adjust dampers for free operation.

3.3 FIELD QUALITY CONTROL:
A. Testing: After installation of ventilators has been completed, test each ventilator to demonstrate proper operation of units at performance requirements specified. When possible, field correct malfunctioning units, then retest to demonstrate compliance. Replace units which cannot be satisfactorily corrected.

3.4 ADJUSTING AND CLEANING:
A. Cleaning: Clean factory-finished surfaces: Repair any marred or scratched surfaces with manufacturer's touch-up paint.

3.5 SPARE PARTS:
A. General: Furnish to Owner, with receipt, one spare set of belts for each belt drive power ventilator.

END OF SECTION

SECTION 15910 - DUCTWORK ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:
- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 00 Specification sections, apply to work of this section.
- B. Division 15 Basic Mechanical Materials and Methods sections apply to work of this section.

1.2 DESCRIPTION OF WORK:
- A. Extent of ductwork accessories work is indicated on drawings and in schedules, and by requirements of this section.
- B. Types of ductwork accessories required for project include the following:
  1. Dampers.
  2. Low pressure manual dampers.
  3. Control dampers.
  4. Counterbalanced relief dampers.
  5. Fire dampers.
  6. Turning vanes.
  7. Duct hardware.
  8. Duct access doors.
  9. Flexible connections.
- C. Refer to other Division 15 sections for testing, adjusting, and balancing of ductwork accessories; not work of this section.

1.3 QUALITY ASSURANCE:
- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of ductwork accessories, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 3 years.
- B. Codes and Standards:
  1. SMACNA Compliance: Comply with applicable portions of SMACNA "HVAC Duct Construction Standards, Metal and Flexible".
  2. Industry Standards: Comply with ASHRAE recommendations pertaining to construction of ductwork accessories, except as otherwise indicated.
  3. UL Compliance: Construct, test, and label fire dampers in accordance with UL Standard 555 "Fire Dampers and Ceiling Dampers".
  4. NFPA Compliance: Comply with applicable provisions of NFPA 90A "Air Conditioning and Ventilating Systems", pertaining to installation of ductwork accessories.

1.4 SUBMITTALS:
- A. Product Data: Submit manufacturer's technical product data for each type of ductwork accessory, including dimensions, capacities, and materials of construction; and installation instructions.
- B. Shop Drawings: Submit manufacturer's assembly-type shop drawings for each type of ductwork accessory showing interfacing requirements with ductwork, method of fastening or support, and methods of assembly of components.
- C. Maintenance Data: Submit manufacturer's maintenance data including parts lists for each type of duct accessory. Include this data, product data, and shop drawings in maintenance manual; in accordance with requirements of Division 00.

PART 2 - PRODUCTS

2.1 DAMPERS:
- A. Low Pressure Manual Dampers: Provide dampers of single blade type or multiblade type, constructed in accordance with SMACNA "HVAC Duct Construction Standards". Provide stand-off brackets that extend the control handles a minimum of 2 inches from the surface of the duct.
- B. Control Dampers: Provide dampers with parallel blades for 2-position control, or opposed blades for modulating control. Construct blades of 16-ga. steel, provide heavy-duty molded self-lubricating nylon bearings, 1/2" diameter steel axles spaced on 9" centers. Construct frame of 2" x 1/2" x 1/8" steel channel for face areas 25 sq. ft. and under; 4" x 1-1/4" x 16-ga. channel for face areas over 25 sq. ft. Provide galvanized steel finish with aluminum touch-up. Provide extensions for all damper operators for volume control dampers located above hard ceilings with no access.
- C. Counterbalanced Relief Dampers: Provide dampers with parallel blades, counterbalanced and factory-set to relieve at indicated static pressure. Construct blades of 16-ga. aluminum, provide 1/2" diameter ball

bearings, 1/2" diameter steel axles spaced on 9" centers. Construct frame of 2" x 1/2" x 1/8" steel channel for face areas 25 sq. ft. and under; 4" x 1-1/4" x 16-ga. channel for face areas over 25 sq. ft. Provide galvanized steel finish on frame with aluminum touch-up.

D. Manufacturer: Subject to compliance with requirements, provide dampers of one of the following:
   1. Air Balance, Inc.
   2. Airguide Corp.
   3. American Warming & Ventilating, Inc.
   4. Arrow Louver and Damper; Div. of Arrow United Industries, Inc.
   5. Louvers & Dampers, Inc.
   6. Penn Ventilator Co.
   7. Ruskin Mfg. Co.
   8. Greenheck

2.2 Fire dampers:

A. Fire Dampers: Provide dynamic fire dampers, of types and sizes indicated. Dampers shall have horizontal or vertical spring closure operation for assured operation under airflow conditions. Construct casings of 11-ga. galvanized steel. Provide fusible link rated at 160 to 165°F (71 to 74°C) unless otherwise indicated. Dampers shall be installed out of the air stream so that there is no restriction imposed upon the flow of air. Provide damper with positive lock in closed position, and with the following additional features:
   1. Damper Blade Assembly: Curtain type.
   2. Blade Material: Steel, match casing.

B. Manufacturer: Subject to compliance with requirements, provide fire and smoke dampers of one of the following:
   1. Air Balance, Inc.
   2. American Warming & Ventilating, Inc.
   3. Arrow Louver and Damper; Div. of Arrow United Industries, Inc.
   4. Louvers and Dampers, Inc.
   5. Penn Ventilator Co.
   6. Phillips-Aire.
   7. Ruskin Mfg. Co.
   8. Greenheck

2.3 TURNING VANES:

A. Manufactured Turning Vanes: Provide turning vanes constructed of 1-1/2" wide curved blades set at 3/4" o.c., supported with bars perpendicular to blades set at 2" o.c., and set into side strips suitable for mounting in ductwork.

B. Acoustic Turning Vanes: Provide acoustic turning vanes constructed of airfoil shaped aluminum extrusions with perforated faces and fiberglass fill.

C. Manufacturer: Subject to compliance with requirements, provide turning vanes of one of the following:
   1. Aero Dyne Co.
   2. Airsan Corp.
   3. Anemostat Products Div.; Dynamics Corp. of America.
   4. Barber-Colman Co.
   5. Duro Dyne Corp.
   6. Environmental Elements Corp.; Subs. Koppers Co., Inc.
   7. Hart & Cooley Mfg. Co.
   8. Register & Grille Mfg. Co., Inc.
   9. Souther, Inc.

2.4 DUCT HARDWARE:

A. General: Provide duct hardware, manufactured by one manufacturer for all items on project, for the following:
   1. Test Holes: Provide in ductwork at fan inlet and outlet, and elsewhere as indicated, duct test holes, consisting of slot and cover, for instrument tests.
   2. Quadrant Locks: Provide for each damper, quadrant lock device on one end of shaft; and end bearing plate on other end for damper lengths over 12". Provide extended quadrant locks and end extended bearing plates for externally insulated ductwork. Provide extensions for all damper operators for volume control dampers located above hard ceilings with no access.

B. Manufacturer: Subject to compliance with requirements, provide duct hardware of one of the following:
   1. Ventfabrics, Inc.
   2. Young Regulator Co.

2.5 DUCT ACCESS DOORS:
- A. General: Provide where indicated, duct access doors of size indicated.
- B. Construction: Construct of same or greater gage as ductwork served, provide insulated doors for insulated ductwork. Provide flush frames for uninsulated ductwork, extended frames for externally insulated duct. Provide one size hinged, other side with one handle-type latch for doors 12" high and smaller, 2 handle-type latches for larger doors.
- C. Manufacturer: Subject to compliance with requirements, provide duct access doors of one of the following:
  1. Air Balance Inc.
  2. Duro Dyne Corp.
  3. Register & Grille Mfg. Co., Inc.
  4. Ruskin Mfg. Co.
  5. Ventfabrics, Inc.
  6. Zurn Industries, Inc.; Air Systems Div.

2.6 FLEXIBLE CONNECTIONS:
- A. General: Provide flexible duct connections wherever ductwork connects to vibration isolated equipment. Construct flexible connections of neoprene-coated flameproof fabric crimped into duct flanges for attachment to duct and equipment. Make airtight joint. Provide adequate joint flexibility to allow for thermal, axial, transverse, and torsional movement, and also capable of absorbing vibrations of connected equipment.
- B. Manufacturer: Subject to compliance with requirements, provide flexible connections of one of the following:
  1. American/Elgen Co.; Energy Div.
  2. Duro Dyne Corp.
  3. Flexaust (The) Co.
  4. Ventfabrics, Inc.

PART 3 - EXECUTION

3.1 INSPECTION:
- A. Examine areas and conditions under which ductwork accessories will be installed. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 INSTALLATION OF DUCTWORK ACCESSORIES:
- A. Install ductwork accessories in accordance with manufacturer's installation instructions, with applicable portions of details of construction as shown in SMACNA standards, and in accordance with recognized industry practices to ensure that products serve intended function.
- B. Install turning vanes in square or rectangular 90^{o} elbows in supply and exhaust air systems, and elsewhere as indicated.
- C. Install access doors to open against system air pressure, with latches operable from either side, except outside only where duct is too small for person to enter. Install access doors adjacent to all fire dampers to allow maintenance and inspection of each fire damper. Minimum size of access doors shall be 12 inches square.
- D. Coordinate with other work, including ductwork, as necessary to interface installation of ductwork accessories properly with other work.

3.3 ADJUSTING AND CLEANING:
- A. Adjusting: Adjust ductwork accessories for proper settings.
- B. Label access doors in accordance with Division 15 section "Mechanical Identification".
- C. Final positioning of manual dampers is specified in Division 15 section "Testing, Adjusting, and Balancing".
- D. Cleaning: Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.

END OF SECTION

SECTION 15932 - AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 00 Specification sections, apply to work of this section.

1.2 DESCRIPTION OF WORK
- A. Extent of air outlets and inlets work is indicated by drawings and schedules, and by requirements of this section.
- B. Types of air outlets and inlets required for project include the following:
  1. Ceiling air diffusers.
  2. Louvers.
- C. Refer to other Division 15 sections for ductwork and duct accessories required in conjunction with air outlets and inlets; not work of this section.
- D. Refer to other Division 15 sections for balancing of air outlets and inlets; not work of this section.

1.3 QUALITY ASSURANCE
- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of air outlets and inlets of types and capacities required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Codes and Standards:
  1. ARI Compliance: Test and rate air outlets and inlets in accordance with ARI 650 "Standard for Air Outlets and Inlets".
  2. ASHRAE Compliance: Test and rate air outlets and inlets in accordance with ASHRAE 70 "Method of Testing for Rating the Air Flow Performance of Outlets and Inlets".
  3. NFPA Compliance: Install air outlets and inlets in accordance with NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems".

1.4 SUBMITTALS:
- A. Product Data: Submit manufacturer's technical product data for air outlets and inlets including the following:
  1. Schedule of air outlets and inlets indicating drawing designation, room location, number furnished, model number, size, and accessories furnished.
  2. Data sheet for each type of air outlet and inlet, and accessory furnished; indicating construction, finish, and mounting details.
  3. Performance data for each type of air outlet and inlet furnished, including aspiration ability, temperature and velocity traverses, throw and drop, and noise criteria ratings. Indicate selections on data.
- B. Shop Drawings: Submit manufacturer's assembly-type shop drawing for each type of air outlet and inlet, indicating materials and methods of assembly of components.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING:
- A. Deliver air outlets and inlets wrapped in factory-fabricated fiber-board type containers. Identify on outside of container type of outlet or inlet and location to be installed. Avoid crushing or bending and prevent dirt and debris from entering and settling in devices.
- B. Store air outlets and inlets in original cartons and protect from weather and construction work traffic. Where possible, store indoors; when necessary to store outdoors, store above grade and enclose with waterproof wrapping.

PART 2 - PRODUCTS

2.1 CEILING AIR DIFFUSERS:
- A. General: Except as otherwise indicated, provide manufacturer's standard ceiling air diffusers where shown; of size, shape, capacity, and type indicated; constructed of materials and components as indicated, and as required for complete installation.
- B. Performance: Provide ceiling air diffusers that have, as minimum, temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device as listed in manufacturer's current data.
- C. Ceiling Compatibility: Provide diffusers with border styles that are compatible with adjacent ceiling systems, and that are specifically manufactured to fit into ceiling module with accurate fit and adequate support. Refer to general construction drawings and specifications for types of ceiling systems which will contain each type of ceiling air diffuser.

D. Diffuser Dampers: Fire Damper: Combination adjustable opposed blade damper and fusible link fire damper with UL approved link and assembly designed to meet requirements of NFPA 90A.
E. Types: Provide ceiling diffusers of type, capacity, and with accessories and finishes as listed on diffuser schedule.
F. Manufacturer: Subject to compliance with requirements, provide diffusers of one of the following:
   1. Anemostat Products Div.; Dynamics Corp. of America.
   2. Carnes Co.; Div. of Wehr Corp.
   3. Krueger Mfg. Co.
   4. Metalaire
   5. Titus Products Div.; Philips Industries, Inc.
   6. Price Industries

2.2 LOUVERS:
A. General: Except as otherwise indicated, provide manufacturer's standard louvers where shown; of size, shape, capacity, and type indicated; constructed of materials and components as indicated, and as required for complete installation.,
B. Performance: Provide louvers that have minimum free area, and maximum pressure drop for each type as listed in manufacturer's current data, complying with louver schedule.
C. Substrate Compatibility: Provide louvers with frame and sill styles that are compatible with adjacent substrate, and that are specifically manufactured to fit into construction openings with accurate fit and adequate support, for weatherproof installation. Refer to general construction drawings and specifications for types of substrate which will contain each type of louver.
D. Materials: Construct of aluminum extrusions, ASTM B 221, Alloy 6063-T52. Weld units or use stainless steel fasteners.
E. Louver Screens: On inside face of exterior louvers, provide 1/2" square mesh anodized aluminum wire bird screens mounted in removable extruded aluminum frames.
F. Manufacturer: Subject to compliance with requirements, provide louvers of one of the following:
   1. Airolite Co.
   2. American Warming & Ventilating, Inc.
   3. Arrow United Industries, Inc.
   4. Dowco Corp.
   5. Greenheck Fan Company
   6. Louvers & Dampers, Inc.
   7. Ruskin

PART 3 - EXECUTION

3.1 INSPECTION:
A. Examine areas and conditions under which air outlets and inlets are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION:
A. General: Install air outlets and inlets in accordance with manufacturer's written instructions and in accordance with recognized industry practices to insure that products serve intended functions.
B. Coordinate with other work, including ductwork and duct accessories, as necessary to interface installation of air outlets and inlets with other work.
C. Locate ceiling air diffusers, registers, and grilles, as indicated on general construction "Reflected Ceiling Plans". Unless otherwise indicated, locate units in center of acoustical ceiling modules.

3.3 SPARE PARTS:
A. Furnish to Owner, with receipt, 3 operating keys for each type of air outlet and inlet that require them.

END OF SECTION

SECTION 15990 - TESTING AND BALANCING OF HVAC SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions, of this specification division, Division 00 specification sections and the Commissioning Specification apply to work of this Section.

1.2 TESTING and BALANCING OF HVAC SYSTEMS

A. Selection: The Construction Manager or Prime Contractor, herein referred to as Contractor, shall procure the services of, and have a contract with, an independent Test and Balance contractor (Balancer), which specializes in the testing and balancing of heating, ventilating, and air conditioning systems. The Balancer shall test, balance and adjust all water circulating and air moving equipment, air distribution, and exhaust systems, and temperature control equipment and systems as herein specified and shown on the drawings.

B. The Contractor shall award the test and balance contract to the Balancer as soon as possible to allow them to schedule the work in cooperation with other trades and to meet the completion date. The Contractor shall prepare a critical path schedule, coordinated with all subcontractors, so as to accomplish all tasks required of the Balancer as scheduled herein.

C. Refer to specific items of work provided by each installer, and outlined in the paragraph entitled, "CONTRACTOR'S RESPONSIBILITIES." Contractor shall cooperate with the Balancer as required during execution of the work under this section.

D. The Balancer shall inspect all work under the above sections as it relates to work under this section and report in writing to the Contractor and Architect any deviations from plans and specifications that will affect the performance of the systems. All correspondence (written, fax, electronic mail, and the like) is to be copied to the Testing and Commissioning Contractor (Commissioner) that is directly contracted by the Owner.

E. Design balance deviation tolerances:

1. All HVAC systems (water and air) shall be balanced to +/-5% of design.
    a. Exceptions:
        aa. Exhaust and supply fans where the design airflow is less than 100 CFM: Balance to between 100% and 110%.
        bb. Air distribution devices where the design is less than 100 CFM: Balance to within +/- 10%.
        cc. Set pumps to 100%-105% of design flow.
2. Each form presented in the report shall include a column that shows the amount of deviation from the design values in percent (%).

1.3 BALANCER QUALIFICATIONS

A. The Balancer shall be a member in good standing with The Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB) and shall provide a National Project Certification Performance Guaranty to the Owner. The Balancer must be totally independent, having no affiliation with any contractor, design engineer, or equipment manufacturer/supplier of HVAC related equipment.

B. The Balancer shall have a fully staffed office and have been regularly engaged in the testing and balancing of heating, ventilating, and air conditioning systems.

C. The Balancer shall provide proof that personnel performing work have successfully completed at least five (5) projects of similar size and scope. A complete list of reference projects, including name and phone number of contacts, shall be submitted with the bid.

D. All instruments used shall be accurately calibrated within six months of balancing and maintained in good working order. If requested, the test shall be conducted in the presence of the Architect/Engineer and/or his representative.

1.4 BALANCER SUBMITTALS

A. Provide a testing and balancing plan for review within thirty days upon receipt of contract. The plan review should include comments and recommendations on any discrepancies that may hinder balancing. This plan review shall be transmitted directly to the Contractor.

B. Submit to Contractor, equipment pre-start and start-up forms. After receipt from the contractor of the submittal data, forms will be transmitted by the Balancer to the Mechanical Contractor for use in equipment start-up. The completed forms will be turned over to the Balancer prior to the beginning of the test and balance phase.

C. Submit agenda of test procedures for each system, describing balancing standards for the testing and balancing of the air conditioning, heating, and ventilating systems for the approval of the Architect/Engineer.

This agenda shall include all forms for each system and component, with specified data from the project plans and specifications included on the forms.

D. The Final Testing and Balance Report, with the Engineer's letter of acceptance, must be received by the Owner's Project Coordinator no later than 30 days after substantial completion inspection. (See also paragraphs 1.6.B and 3.1.B.)

1.5 BALANCER MEETINGS, INSPECTIONS AND TESTS

A. Make inspections of the systems during construction for proper installation of balancing devices and general construction as related to HVAC testing and balancing work. The number of inspections will vary with size and complexity of the project, but a minimum of two inspections is required: one at 50% completion of ductwork installation, the second at 80% completion of ductwork installation. A written report of each job visit shall be sent to the Construction Manager for transmittal to the Architect/Engineer.
B. Perform Final Test and Balance work associated with the HVAC system as described herein.
C. A minimum of one after-occupancy inspection shall be made within 90 days of the final test and balance. At this time, any minor adjustments shall be made for occupant comfort. Major problems, which will require major readjustments, shall be addressed to the Architect / Engineer prior to any readjustments. Any alterations to the final test and balance report shall be transmitted as a revised report to the Construction Manager for transmittal to the Architect/Engineer.

1.6 BALANCER WARRANTY AND REPORTS

A. Provide National Project Certification Performance Guarantee. This Performance Guarantee is to be either by NEBB or AABC. Depending on which organization is chosen, the report is not to mention, or include reference to the other organization.
B. The Owner will not delay acceptance of the HVAC system due to lack of an approved T&B report clear of any deficiencies. If the approved report is not submitted within 30 days after substantial completion date, liquidated damages will be assessed.
C. Provide five copies of tabulated report (1 for the Engineer and 4 for the Owner) in neatly organized typed form with AABC or NEBB approved minimum data, within fifteen working days after completion of test. Include one (1) electronic copy to the Owner. Report will include start-up reports, equipment test data and drawings to coincide with the test report. In addition, all reports shall incorporate a summary page(s), which shall include:
    1. General description of project (building type, system type, equipment description, etc.)
    2. A descriptive list of all equipment and test results (sorted building by building) which do NOT meet plans and specifications. All equipment and test data NOT listed on the above-mentioned summary page(s) will be considered to perform within design tolerance requirements specified in 1.2.E.
    3. Copies of reduced plan drawings that uniquely identify and cross-reference air devices, VAV boxes, dampers, equipment, etc.
    4. Duct pressure test/leakage and Hydrostatic leakage test reports.
    5. Building Pressure tables, design and actual.
    6. Start-up reports.
    7. Inspection reports.
D. The completed report will be reviewed by the A/E Engineer prior to submission to the District. The report will be returned for corrections or retesting should the report be found to be deficient. When submitting the revised data, include the entire report. All pages shall be numbered. Any revised pages of the report shall show the date that the data was revised. The cover page shall show the first edition date along with the date the report was revised.
E. The District reserves the right to provide verification of the test and balance reports and such verification shall be by a second independent contractor. Reports found to be inaccurate will be disallowed and the test and balance contractor will be required to repeat operations under the supervision of the second independent contractor until accurate reports are completed and agreed upon. The cost of initial checking will be borne by the School District, unless the initial report is found to be inaccurate. In such case, the costs of the verification test and balance and all subsequent costs of supervision in order to secure acceptable reports will be borne by the test and balance contractor.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 CONTRACTOR'S RESPONSIBILITIES

A. Final testing and balancing of the HVAC systems shall be performed as specified above. It is the responsibility of the Contractor to be completely familiar with all the provisions and responsibilities of the Balancer, and to provide such certification, cooperation, and support required.

B. The Contractor shall repair all deficiencies noted by the Balancer in a timely manner. The Balancer will notify the contractor in writing, on a daily basis, of any deficiencies discovered and Contractor will notify The Balancer immediately, in writing, upon completion of the repairs. The cost for extra re-testing by the Balancer due to unrepaired items that were certified as repaired will be the responsibility of the Contractor. The final testing and balancing report will contain no punch list items. All deficiencies will have been corrected prior to submission of the final report. Preliminary reports are not to be submitted to the Owner.

C. The Contractor shall:
   1. Allow adequate time in the construction schedule to perform the Testing and Balancing work.
   2. Notify the Balancer upon commencement of work related to the HVAC system.
   3. Provide required shop drawings and equipment data.
   4. Provide test openings as required for testing and balancing HVAC systems.
   5. Provide updated job schedule and timely notice prior to scheduled events.
   6. Provide test openings and temporary end caps or otherwise seal off ends of ductwork to permit leakage testing prior to installation of diffusers, grilles, and similar devices.
   7. Make preliminary tests to establish adequacy, quality, safety, completed status, and satisfactory operation of HVAC systems and components. The systems shall be free of electrical grounds and short circuits.
   8. Perform duct leakage tests, in the presence of the Balancer, on all supply, return, outside air make-up, and exhaust air systems.
   9. Within the intent of the contract documents, provide, at the request of the Balancer, all equipment, material, supplies, workmen, and supervisions necessary to provide a satisfactory, operating system.
   10. During the test and balance period, operate all HVAC equipment as necessary to permit systems to be tested and balanced as fully operating, functional systems.
   11. Work harmoniously with the Balancer, providing all courtesies normally extended to professional consultants.
   12. Perform all work necessary to make ceiling plenums air-tight and functional.
   13. Remove and replace ceilings as necessary to permit test and balance operations.
   14. Remove and replace equipment, lights, or other items which obstruct testing and balancing operations. Where equipment, lights, or other items will interfere with future adjustments of the HVAC system, such equipment, lights, or other items shall be relocated by the Contractor, as directed by the Architect.
   15. Provide completed start-up forms on each piece of equipment.
   16. Replace belts and drives as required for proper balancing. Drives shall be adjusted and aligned by the Contractor to prevent abnormal belt wear and vibration.
   17. Adjust fan speed as required not to exceed RFLA of motor.
   18. Open all manually adjustable dampers and test dampers for smooth, vibration-free operation.
   19. Verify that all controls are installed and operating in accordance with the sequence of operation.
   20. Before requesting final testing and balancing, submit signed statement that HVAC systems are installed, adjusted, fully lubricated, operating satisfactorily, and are ready for use.

D. Duct Leakage Report: The Contractor shall make all the supply, return, outside air, and exhaust duct systems (limited to 1,500 CFM and greater) operationally air-tight, with no more than 2% leakage for duct systems rated at 2" w.c. pressure class, and 1% leakage for systems exceeding 2" w.c. pressure class. Leakage test to be performed by Contractor with all air device openings and fan connections sealed airtight. Test the systems prior to applying any insulation or concealing in soffits or chases. Use a portable fan capable of producing a static pressure equal or greater than the duct test pressure. This fan to have a flow measuring assembly consisting of a straight section of duct with an orifice plate, pressure taps, and a calibrated performance curve for determining leakage rates.
   1. Test each section equal to the external static pressure indicated for that fan or air handler with the portable fan assembly. After the fan achieves that steady state design pressure, record the airflow quantity across the orifice and the percent of design airflow. If the test fails, the Contractor shall reseal and retest at no additional cost to the District.
   2. Repair all duct leaks that can be heard or felt, even if the system has passed the leakage test.
   3. Submit duct leakage reports to the Balancer and the Architect for their review and approval.

3.2 BALANCER'S RESPONSIBILITIES

A. Air Balance: The Balancer shall perform the following tests, and balance system in accordance with the following requirements:
   1. Record minimum data required by AABC and NEBB forms.
   2. Test and adjust fan rpm to design requirements.
   3. Test and record motor full load amperage/voltage and operating amperage/voltage.
   4. Make pitot tube traverse of main supply, return, OA and exhaust ducts and obtain design CFM at fans. The air flow in rectangular duct shall be traversed and measured using the log-Tchebycheff method and round duct shall be measured with the log-Linear method (a.k.a. log-Tchebycheff), no exceptions. Refer

to the AABC's 1989 National Standards Manual Chapter 8; NEBB's latest Procedural Standards, Section 10; and ASHRAE's 1997 Fundamentals Handbook Chapter 14.
5. Test and adjust system for design CFM recirculated air.
6. Test and adjust system for design CFM outside air.
7. Test and record system static pressure profile.
8. Adjust all main supply and return air ducts to proper design CFM.
9. Adjust all zones to proper design CFM, supply, return, and exhaust.
11. Provide suggestion/corrective measures pertaining to performance related issues.
12. Test and adjust each air distribution device.
13. Each grille, diffuser, and register shall be identified as to the location, area, and system.
14. Test and adjust fans.
16. Provide a Table in the report that itemizes all the Outside Air Make-up CFM compared to all the Exhaust Air CFM (specified and actual) that is to demonstrate that the building is experiencing a continual positive pressure. There is to be one Table per building.

B. Size, AK catalog factors of diffusers, grilles, registers, and all tested equipment shall be identified and listed.
C. Readings and test of diffusers, grilles, and registers shall include required fpm velocity and test resultant velocity, required CFM, and test resultant CFM after adjustments. When direct CFM measuring instruments are used, velocities are not required.
D. In cooperation with the controls contractor, set adjustments of automatically operated dampers to operate as specified, indicated, and / or noted.
E. Check all controls for proper calibrations, and list all controls requiring adjustment by control installers.
F. All diffusers, grilles, and registers shall be adjusted to minimize drafts in all areas.
G. Witness and record the testing of the ductwork for leakage to insure proper sealing. The Balancer shall randomly select sections of the completed duct system for testing. The sections selected shall not exceed more than 20% of the measured linear footage of supply, return, exhaust, or plenum duct length. All selected ductwork shall be leak tested in accordance with SMACNA. Maximum allowable leakage at any tested section shall not exceed 2% of the total air. If any of the selected duct sections exceed the specific leakage allowance, those sections shall be repaired by the Contractor and retested by the Balancer. If initial testing exceeds specification allowance, testing of all remaining duct ductwork shall be required at the Contractor's expense. All additional costs for duct leak repair and retesting shall be the responsibility of the Contractor.
H. Advise Contractor in writing of all ductwork that shall be repaired to reduce air leakage. Retest to confirm minimum allowable leakage. The cost of retest of failed systems will be the responsibility of the Contractor.
L. Record the Dry Bulb Temperature in each space and in addition, record a wet bulb temperature at each thermostat or sensor.
M. Deficiencies: All deficiencies shall be noted by the Balancer in a field report and submitted to Contractor and the Architect on a daily basis. All deficiencies will be uniquely numbered and tracked.
O. Upon correction of deficiencies, the Contractor shall notify the Balancer in writing that the problem is resolved. If any deficiencies are not corrected, the Contractor will be responsible for the cost of additional re-testing.
P. Equipment: All information required as shown, but not limited to, shall be compiled in a neat, orderly, itemized format on 8½" x 11" test forms. The following data shall be submitted to the Contractor, for distribution to the Architect/Engineer and Owner. This data is the minimum required data except where specified standard (i.e. AABC) requires additional data. In addition, any HVAC equipment specified for the project, but not indicated below, is required per AABC form.
S. Fans:
   1. Mark number
   2. Manufacturer and model number
   3. Total CFM supply and rpm - specified and actual
   4. Static pressure (discharge static - suction static)
   5. Full load amperage - specified and actual
   6. Voltage, phase, and cycles - specified and actual
T. Air Devices (grilles, Registers, Diffusers, and Louvers):
   1. Mark number
   2. Room number
   3. CFM - specified and actual
   4. Size
   5. Effective area
   6. Velocity FPM - specified and actual
Y. DX Equipment:
   1. Mark number
   2. Unit manufacturers and model number

3. Total supply air CFM and rpm - specified and actual
4. Return air CFM - specified and actual
5. Outside air CFM - specified and actual
6. Hot Gas Reheat Coil - entering & leaving air DB/ OF and WB/ OF - specified & actual
7. Specified total and external static pressure
8. Cooling Coil - entering and leaving air DB/ OF and WB/ OF - specified and actual
9. Outside air DBF and WBF at time of test
10. Voltage, phase, and cycle specified load conditions
11. Hand calculations of the BTUH at test conditions of Total cooling, Latent cooling and Sensible cooling.

END OF SECTION

SECTION 16050 - ELECTRICAL METHODS AND REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 specification sections, apply to work of this section.

B. Furnish and install all electrical wiring, systems, equipment and accessories in accordance with the specifications and drawings. Capacities and ratings of motors, cable, panelboards, etc., and arrangement for specified items in general are shown on drawings.

C. All ampacities herein specified or indicated on the drawings are based on copper conductors, with the conduit and raceways accordingly sized. Aluminum conductors are not permitted.

1.2 MINIMUM REQUIREMENTS

A. References to the National Electrical Code (NEC), Underwriters Laboratories, Inc. (UL), Florida Building Code, and National Fire Protection Association (NFPA) are a minimum installation requirement standard. Design drawings and other specification sections shall govern in those instances where requirements are greater than those specified in NEC.

B. The rules and regulations of the Federal, State, local, civil authorities and utility companies in force at the time of execution of the contract shall become a part of this specification. In addition, the following codes and standards shall apply:

1. 5th Edition of the Florida Building Code, 2014
2. National Electrical Code, 2011
3. 5th Edition of The Florida Fire Prevention Code (FFPC): (This Code also includes the Florida versions of NFPA 1 And NFPA 101.) (Effective December 31, 2014)

C. No work shall be done unless the Superintendent of the Contractor is on the job site. Work shall be properly protected, all rubbish removed promptly, and exposed work shall be carefully cleaned prior to final acceptance.

D. The term "provide" shall include labor, materials, and equipment necessary to furnish and install, complete and operable, the item or system indicated.

E. In decisions arising from discrepancies, interpretation of Drawings and Specifications, substitutes, and other pertinent matters, the decision of the Owner's representative's approval shall be final.

1.3 SPECIFICATIONS AND DRAWINGS

A. Plans show location of fixtures and equipment and are intended to depict the general intent of the work in scope, layout and quality of workmanship. They are not intended to show in minute detail every or all accessories intended for the purpose of executing the work, but it is understood that such details are a part of this work.

B. Where Drawings and Specifications conflict, it shall be the responsibility of this Contractor to bring such conflict to the attention of the Architect/Engineer for clarification. In general, the Architectural Drawings shall take precedence over the Mechanical Drawings with reference to building construction. All changes from the Drawings necessary to make the work conform with the building as constructed and to fit the work of other trades or to conform to the rules of authorities having jurisdiction, shall be made by the Contractor at his own expense.

C. Keep a record of the locations of concealed work and of any field changes in Contract Drawings and Specifications for each trade and, upon completion of the job, supply "As-Built" Drawings and Specifications showing in pencil on sepia reproducibles, any deviations from the original Drawings, indicating in the Specifications each manufacturer's name underlined or inserted whose product was used on the job. These Drawings shall indicate dimensions of buried utility lines from building walls. One set of sepia reproducibles of the original tracings will be furnished upon request for this purpose.

1.4 STANDARDS

A. All material and equipment shall be listed, labeled or certified by Underwriters Laboratories, Inc., where such standards have been established. Equipment and material which are not covered by UL Standards will be accepted provided equipment and material is listed, labeled, certified or otherwise determined to meet safety requirements of a nationally recognized testing laboratory. Equipment of a class which no nationally recognized testing laboratory accepts, certifies, lists, labels, or determines to be safe, will be considered if inspected or tested in accordance with national industrial standards, such as NEMA, or ANSI. Evidence of compliance shall include certified test reports and definitive shop drawings.

B. Definitions:

1. Listed: Equipment is "listed" if of a kind mentioned in a list which:

a. Is published by a nationally recognized laboratory which makes periodic inspection of production of such equipment.
b. States that such equipment meets nationally recognized standards or has been tested and found safe for use in a specified manner.

2. Labeled: Equipment is labeled if:
   a. It embodies a valid label, symbol, or other identifying mark of a nationally recognized testing laboratory such as Underwriters Laboratories, Inc.
   b. The laboratory makes periodic inspections of the production of such equipment.
   c. The labeling indicates compliance with nationally recognized standards or tests to determine safe use in a specified manner.
3. Certified: Equipment is "certified" if:
   a. Equipment has been tested and found by a nationally recognized testing laboratory to meet nationally recognized standards or to be safe for use in a specified manner.
   b. Production is periodically inspected by a nationally recognized testing laboratory.
   c. It bears a label, tag, or other record of certification.
4. Nationally recognized Testing Laboratory: A testing laboratory which is approved, in accordance with OSHA regulations, by the Secretary of Labor.

1.5 QUALIFICATIONS (PRODUCTS AND SERVICES)

A. Manufacturers Qualifications: The manufacturer shall regularly and presently produce, as one of the manufacturer's principal products, the equipment and material specified for this project, and shall have manufactured the item for at least five years, unless otherwise noted elsewhere in the specifications or on the drawings.
B. Product Qualification:
   1. Manufacturer's product shall have been in satisfactory operation on three installations of similar size and type, as this project, for approximately three years.
   2. The Owner reserves the right to require the contractor to submit a list of installations where the products have been in operation before approval of said products.
C. Service Qualifications: There shall be a permanent service organization maintained or trained by the manufacturer which will render satisfactory service to this installation within four hours of receipt of notification that service is needed. Submit name and address of service organizations.

1.6 MANUFACTURED PRODUCTS

A. Materials and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items, for which replacement parts should be available. Items not meeting this requirement, but which otherwise meet technical specifications, and merits of which can be established through reliable test reports or physical examination of representative samples, will be considered.
B. When more than one unit of the same class of equipment is required, such units shall be the product of a single manufacturer.
C. Equipment Assemblies and Components:
   1. All components of an assembled unit need not be products of the same manufacturer, however, the assembled unit shall be the responsibility of a single manufacturer and warranted as such.
   2. Manufacturers of equipment assemblies, which include components made by others, shall assume complete responsibility for the final assembled unit.
   3. Components shall be compatible with each other and with the total assembly for the intended service.
   4. Constituent parts which are similar shall be the product of a single manufacturer.
D. All factory wiring shall be identified on the equipment being furnished and on all wiring diagrams.

1.7 EQUIPMENT REQUIREMENTS

A. Equipment voltage ratings shall be in accordance with the requirements indicated on the drawings or as specified.
B. Prior to bid, written approval shall be obtained by the Contractor for any equipment that differs from those specified on the drawings and specifications. The Contractor shall be prepared to submit samples of the equipment when requested at no cost to the Architect/Engineer.
   1. The Contractor shall furnish drawings showing all installation details, shop drawings, technical data and other pertinent information as required to determine that the equipment is equivalent in quality and function to the equipment specified.
   2. Approval by the Architect/Engineer of the equal equipment does not relieve the Contractor of the responsibility of furnishing and installing the equipment at no additional cost to the Owner.
   3. Any other items required for the satisfactory installation of the equal equipment shall be furnished and installed at no additional cost to the Owner. This includes but shall not be limited to additions or changes to branch circuits, circuit protective devices, conduits, wire, feeders, controls, panels and correlation with other work, subject to the jurisdiction and approval of the Architect/Engineer.

C. Catalogue numbers, where given, are intended to give a basis for design, quality and function. Any other incidental equipment needed for a complete and functional installation shall be provided at no additional cost.

1.8 EQUIPMENT PROTECTION

A. Equipment and material shall be protected during shipment and storage against physical damage, dirt, moisture, cold and rain.
B. During installation, equipment, controls, controllers, circuit protective devices, etc., shall be protected against entry of foreign matter; and be vacuum cleaned both inside and outside before testing, operating and painting.
C. Damaged equipment shall be, as determined by the Architect/Engineer, placed in first class operating condition or be returned to the source of supply for repair or replacement.
D. Painted surfaces shall be protected with factory installed removable heavy kraft paper, sheet vinyl or equal.
E. Damaged paint on equipment and materials shall be refinished with the same quality of paint and workmanship as used by the manufacturer so repaired areas are not obvious.

1.9 WORK PERFORMANCE

A. Arrange, phase and perform work to assure electrical service for other buildings at all times.
B. New work shall be installed and connected to existing work neatly and carefully. Disturbed or damaged work shall be replaced or repaired to its prior conditions.
C. Coordinate location of equipment and conduit with other trades to minimize interferences.
D. Obtain and pay for all required installation inspections and deliver certificates approving installations to the Owner unless directed otherwise.

1.10 EQUIPMENT INSTALLATION AND REQUIREMENTS

A. Equipment location shall be as close as practical to locations shown on the drawings. Where architectural features govern location of work, refer to architectural drawings.
B. Working spaces shall not be less than specified in the National Electrical Code for all voltages specified.
C. Inaccessible Equipment:
   1. Where the Owner/Architect/Engineer determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance, equipment shall be removed and reinstalled as directed at no additional cost to the Owner.
   2. "Conveniently accessibility" is defined as being capable of being reached without the use of ladders, or without climbing or crawling under or over obstacles such as motors, pumps, belt guards, transformers, piping, and duct work.
D. Equipment and Material:
   1. New equipment and material shall be installed, unless otherwise specified.
   2. Equipment and material shall be designed to assure satisfactory operation and operating life for environmental conditions where being installed. NEC and other code requirements shall apply to the installation in areas requiring special protection such as explosion-proof, watertight and weatherproof construction.
E. Utility Services:
   1. Determine utility connection requirements and include in the base bid all costs to the Owner for utility service.
   2. Include all costs for temporary service, temporary routing of service or any other requirements of a temporary nature associated with the utility service.
F. Continuity of Service:
   1. No service shall be interrupted or changed without permission from the Architect and the Owner. Written permission shall be obtained before any work is started.
   2. When interruption of services is required, all persons concerned shall be notified and a prearranged time agreed upon.
G. Concrete Work:
   1. Provide all cast-in-place concrete shown on the documents unless noted otherwise. Concrete work shall conform to all applicable Division 2 and 3 specification sections.
   2. Provide all anchor bolts, metal shapes and templates required to be cast in concrete or used to form concrete for support of electrical equipment.

1.11 EQUIPMENT IDENTIFICATION

A. In addition to the requirements of the National Electrical Code, install an identification nameplate which will clearly indicate information required for use and maintenance of items such as switchboard, panelboards, cabinets, safety switches, separately enclosed circuit breakers, motor starters, communications systems cabinets, control devices and other significant equipment.

B. Nameplates shall be laminated white phenolic resin with a black core with engraved lettering, a minimum of 3/16-inch high. Nameplates that are furnished by manufacturer as a standard catalog item, or where other method of identification is herein specified, are exceptions. Hand written marker is not acceptable.

1.12 SUBMITTALS

A. The Architect/Engineer's approval shall be obtained for all equipment and material before delivery to the job site. Delivery, storage or installation of equipment or material which has not had prior approval will not be permitted at the job site. Submittals shall be made for all equipment and systems as indicated in the respective specification section.

B. All submittals shall include adequate descriptive literature, catalog cuts, shop drawings and other data necessary for the Architect/Engineer to ascertain that the proposed equipment and materials comply with specification and drawing requirements. Catalog cuts submitted for approval shall be legible and clearly identify equipment being submitted.

C. Submittals for individual systems and equipment assemblies which consist of more than one item or component shall be made for the system or assembly as a whole. Partial submittals will not be considered for approval. Submittals shall be submitted for all applicable products and materials specified in each individual section of these specifications.

D. Make submittals for the equipment and materials in accordance with the following:
   1. Mark the submittals, "SUBMITTED UNDER SECTION_____".
   2. Submittals shall be marked to show specification reference including the section and paragraph numbers.
   3. The submittals shall include the following:
      a. Information that confirms compliance with contract requirements. Include the manufacturer's name, model or catalog numbers, catalog information, technical data sheets, shop drawings, pictures, nameplate data and test reports as required. Provide any additional information specifically requested in the individual specification section or on the drawings.

E. Operation and Maintenance Manuals:
   1. Maintenance manuals shall be complete and shall be furnished in a loose leaf binder or in the manufacturer's standard binder. Information shall be sufficient to enable a qualified technician to perform normal first line maintenance and repair. A parts list shall be included which shall include those replacement parts recommended by the equipment manufacturer, quantity of parts, current price and availability of each part.
   2. Operation manuals shall be clear and concise and shall describe, in detail, the information required to properly operate the equipment specified. The manuals shall include complete catalog cuts and as-built wiring diagrams.
   3. Operation and maintenance manuals shall be submitted for approval prior to final close-out.

F. In addition to the requirement of SUBMITTALS, the Owner reserves the right to request the manufacturer to arrange for the Owner's representative(s) to see typical active systems in operation, when there has been no prior experience with the manufacturer or the type of equipment being submitted.

1.13 CUTTING, PATCHING, EXCAVATION, BACKFILL, AND LAYOUT

A. Provide openings and excavation required for the installation of the electrical work. Patch work and backfill as required. Finished work shall match the existing adjoining work.

B. Verify all conditions affecting the work to be performed under this contract.

C. Carefully verify measurements at the site, determine the exact location of chases and openings required. Provide sleeves, inserts, supports, concrete work, and hangers as required. No columns, beams, joists, building foundations nor any other structural building component shall be cut, drilled or disturbed in any way without prior approval. Conflicts shall immediately be brought to the attention of the Architect/Engineer.

D. All excavation on sites containing existing buildings and existing services, shall be done with hand shovel to avoid damage to existing services. Where hand shovel is not practical extreme caution shall be taken when performing excavation. The contractor will be responsible for locating any existing utilities and adjusting manhole and handhole locations and conduit routing as necessary. Any damage incurred by the Contractor shall be repaired by the Contractor in a manner approved by the Architect/Engineer at no cost to the Owner and with no extension of time limitation.

1.14 EXPERIENCE

A. The Contractor performing this work shall be a licensed, reputable firm, regularly performing the type of work incorporated in this project and who also maintains, as part of the firm, a service department with qualified personnel who regularly perform this type of work. The Contractor shall, upon request, show evidence of at least two jobs of similar character and size installed within the preceding two years.

1.15 ELECTRICAL WORK FOR MECHANICAL SYSTEMS
- A. Factory installed starters, controllers, and control equipment mounted in manufactured mechanical equipment necessary for mechanical equipment operation shall be furnished under Division 15 Mechanical.
- B. Power wiring for motors and installation of starters not provided integral with equipment shall be under Division 16 Electrical.
- C. Temperature, humidity, pressure and similar controls essential to the operation of mechanical systems, and wiring and conduit thereof, including interlock wiring, shall be under Division 15 of Specifications, installed in accordance with requirements of Division 16.
- D. Motors shall be furnished under Division 15 Mechanical of capacity required to operate equipment specified, but shall not be less than that specified.
- E. All low voltage (120V and under) temperature control wiring for Division 15 equipment shall be provided under by Division 15.
- F. Division 15 shall provide conduit when required for control wiring, installed in accordance with Division 16 requirements.

1.16 MOTORS
- A. All motors shall be furnished and installed under Division 15 Mechanical and shall be wired under Division 16 Electrical.

1.17 REMOVAL OF RUBBISH
- A. Contractor shall keep premises free from accumulations of waste material or rubbish caused by his employees or work. At completion of work, he shall remove all his tools, scaffolding, surplus materials, and rubbish from building and site. He shall leave premises and his work in a clean orderly condition acceptable to the Architect/Engineer.

1.18 QUIET OPERATION AND VIBRATION
- A. All equipment provided under this section shall operate under all conditions of load free of objectionable sound and vibration. Sound and vibration conditions considered objectionable shall be corrected in an approved manner.
- B. Vibration and sound control shall be by means of approved vibration eliminators or sound attenuators in a manner as specified and as recommended by the manufacturer.

1.19 CLEANING AND ADJUSTMENTS
- A. Upon completion of the work, Contractor shall clean and re-lamp all light fixtures, clean and identify all equipment, adjust and test all equipment and apparatus which he has installed and make certain such apparatus and mechanisms are in proper working order and ready to test.
- B. During construction protect all conduit and equipment from damage and dirt. Cap the open ends of all conduit and equipment.

1.20 STORAGE OF MATERIALS
- A. All materials stored on site shall be properly protected from injury or deterioration. Materials shall not be stored in contact with ground or floor.
- B. Do not remove manufacturer's packing materials until ready to install. Materials showing signs of corrosion, improper handling or storage shall be replaced at no cost to the Owner.
- C. Provide continuous protection for all equipment already installed.

1.21 WATERPROOFING
- A. Where any work pierces waterproofing including waterproof concrete, the method of installation shall be as approved by the Owner before the work is done.
- B. Provide all necessary sleeves, caulking and flashing required to make openings absolutely watertight. Waterproof flashing materials shall be compatible with base materials.

1.22 TESTS
- A. Contractor shall make all tests required to establish the adequacy, quality, safety, completed status and satisfactory operation of all systems to the satisfaction of the Architect/Engineer. Provide all instruments, labor and services necessary to conduct tests.
- B. All conductors for major feeders and services (400 amps and up) shall be megged to test insulation and connection integrity prior to permanent energization.

1.23 INSTRUCTIONS
- A. Fully instruct Owner's personnel in the care and operation of electrical systems, including all communications, sound and fire alarm systems and furnish a letter to the Architect/Engineer advising the particular person(s) who have received such instruction.

1.24 WARRANTY

A. Equipment shall be started, tested, adjusted, and placed in satisfactory operating condition. Furnish a letter addressed to the Architect/Engineer advising that the completed systems have been installed in accordance with the Plans and Specifications and that they are in proper operating condition. The Owner shall receive a written warranty covering all defects in workmanship and material for a minimum period of one year from date of substantial completion. Any defects appearing within this year period shall be repaired or replaced without additional cost to the Owner. Refer to individual specification sections for additional warranty requirements. Longer, extended warranty periods shall apply where specified in any individual specification section.

1.25 ACCEPTANCE

A. Before requesting final inspection:
   1. Complete all work required. If any items are held in abeyance as incomplete for final inspection, list such items together with explanation for delay.
   2. Submit statement that equipment is properly installed, adjusted, tested and operation is satisfactory.
   3. Submit copy of other data as may be outlined in these specifications.

B. Copies of the above data shall be submitted to the Architect/Engineer prior to requesting final inspection.

1.26 SINGULAR NUMBER

A. Where any device or part of equipment is referred to in these specifications in the singular number (such as "the switch"), such reference shall be deemed to apply to as many such devices as are required to complete the installation as shown on the drawings.

1.27 EXISTING ELECTRICAL SYSTEMS

A. Existing power, lighting and low voltage systems for other areas of the building that are to remain shall be protected during construction and shall remain in operation while the building is occupied. Any and all areas that are occupied during construction shall have operational systems, including TV, fire alarm, paging and voice/data cabling infrastructure system. Any damage to any existing systems shall be repaired or replaced as necessary to place it back into acceptable operational condition. All electrical systems are deemed to be operational and in satisfactory condition. At the contractors option, the following systems may be fully tested prior to any work in the building and any existing problems or trouble on these systems shall be reported to the Owner in writing. Any new problems discovered during or after construction that are not documented will be the responsibility of the Contractor to correct at no additional cost to the Owner.
   1. Any TV or AV systems
   2. Fire Alarm System
   3. Sound and paging systems
   4. Voice and Data Network system, including fiber backbone

1.28 PHASING OF POWER AND SYSTEMS

A. Existing power, voice/data network system, fire alarm, and security systems may need to be phased. These systems shall be operational when the building is occupied. All costs for labor and materials necessary to accomplish any required phasing shall be included. Any downtime required for the transition from the old system to the new system shall be coordinated with the Owner and approved by the Owner. Costs for any necessary overtime and use of the Owner’s custodial staff after hours shall be included in the bid.

B. Provide all required temporary power, control and low voltage wiring as necessary to maintain operation of these systems during phasing of the construction.

1.29 MULIT-WIRE BRANCH CIRCUITS

A. All multi-wire branch circuits shall comply with Article 210.4 of the 2008 National Electrical Code. Provide all required handle ties where applicable multi-wire branch circuits are indicated on the drawings.

END OF SECTION

SECTION 16110 - RACEWAYS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 specification sections, apply to work of this section.
- B. This section is a Division-16 Basic Electrical Materials and Methods section, and is part of each Division-16 section making reference to electrical raceways specified herein.

1.2 DESCRIPTION OF WORK
- A. Extent of raceway work is indicated by drawings and schedules. Types of raceways specified in this section include the following:
  1. Electrical metallic tubing (EMT).
  2. Liquid tight flexible metal conduit.
  3. Rigid metal conduit.
  4. Flexible metal conduit.
  5. Rigid non-metallic conduit.

1.3 QUALITY ASSURANCE
- A. Manufacturers: Firms regularly engaged in manufacture of raceway systems of types and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects with electrical raceway work similar to that required for this project.
- C. Codes and Standards:
  1. NEMA Compliance: Comply with applicable requirements of NEMA Standards Publications pertaining to raceways.
  2. UL Compliance and Labeling: Comply with applicable requirements of UL safety standards pertaining to electrical raceway systems. Provide raceway products and components which have been UL-listed and labeled.
  3. NEC Compliance: Comply with applicable requirements of NEC pertaining to construction and installation of raceway systems.

1.4 SUBMITTALS
- A. Product Data: Submit manufacturer's technical product data, including specifications and installation instructions, for each type of raceway system required. Include data substantiating that materials comply with requirements.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING
- A. General: Provide metal conduit, tubing, and fittings of types, grades, sizes, and weights (wall thicknesses) for each service indicated. Die-cast fittings are not acceptable.
- B. Rigid Steel Conduit: Provide rigid steel, zinc-coated, threaded type conforming to FS WW-C-581, ANSI C80.1 and UL 6.
- C. Rigid Metal Conduit Fittings: Cast malleable iron, galvanized or cadmium plated, conforming to FS W-F-408, ANSI C80.4.
  1. Use compression type fittings for raintight connections.
  2. Use compression type fittings for other miscellaneous connections.
- D. Electrical Metallic Tubing (EMT): FS WW-C-563, ANSI C80.3 and UL 797.
- E. EMT Fittings: FS W-F-408, ANSI C80.4. Die cast or malleable iron.
  1. Use compression fittings for raintight connections.
  2. Use compression type for concrete type connections.
  3. Use compression type fittings for miscellaneous connections.
  4. Set screw fitting may be used only where conduits and associated fittings are concealed from view.
- F. Liquid-Tight Flexible Metal Conduit: Provide liquid-tight flexible metal conduit; construct of single strip, flexible, continuous, interlocked, and double-wrapped steel; galvanized inside and outside; coat with liquid-tight jacket of flexible polyvinyl chloride (PVC). Shall be Sealtite or equal.
- G. Liquid-Tight Flexible Metal Conduit Fittings: FS W-F-406, Type 1, Class 3, Style G. Provide cadmium plated, malleable iron fittings with compression type steel ferrule and neoprene gasket sealing rings, with insulated, or non-insulated throat.

H. Flexible Metal Conduit: FS WW-C-566 and UL 1. Formed from continuous length of spiral wound, interlocked zinc-coated strip steel.
I. Flexible Metal Conduit Fittings: Provide conduit fittings for use with flexible steel conduit of threadless hinged clamp type.
   1. Straight Terminal Connectors: One piece body, female end with clamp and deep slotted machine screw for securing conduit, and male threaded end provided with locknut.
   2. 45o or 90o Terminal Angle Connectors: Two-piece body construction with removable upper section, female end with clamp and deep slotted machine screw for securing conduit, and male threaded end provided with locknut.

2.2 NONMETALLIC CONDUIT
A. General: Provide nonmetallic conduit, ducts, and fittings of types, sizes, and weights for each service indicated. Where types and grades are not indicated, provide proper selection determined by Installer to fulfill wiring requirements which comply with provisions of NEC for raceways.
B. Electrical Plastic Conduit:
   1. Heavy Wall Conduit: Schedule 40, 90 C, UL-rated, construct of polyvinyl chloride and conforming to NEMA TC-2, for direct burial, or normal above ground use, UL-listed and in conformity with NEC Article 352, ANSI C33.91.
C. PVC Conduit and Tubing Fittings: NEMA TC 3, mate and match to conduit or tubing type and material.

2.3 MANUFACTURERS
A. Subject to compliance with requirements, provide conduit bodies of one of the following:
   1. Appleton Electric; Div of Emerson Electric Co.
   2. Arrow-Hart Div; Crouse-Hinds Co.
   3. Bell Electric Div; Square D Co.
   4. Gould, Inc.
   5. Killark Electric Mfg. Co.
   6. O-Z/Gedney Div; General Signal Co.
   7. Spring City Electrical Mfg. Co., or equivalent.

PART 3 - EXECUTION

3.1 INSPECTION
A. Examine areas and conditions under which raceways are to be installed, and substrate which will support raceways. Notify Architect in writing of conditions detrimental to proper completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSTALLATION OF RACEWAYS
A. General: Install raceways as indicated; in accordance with manufacturer's written installation instructions, and in compliance with NEC, and NECA's "Standards of Installation". Install units plumb and level, and maintain manufacturer's recommended clearances.
B. Coordinate with other work including wires/cables, boxes, and panel work, as necessary to interface installation of electrical raceways and components with other work.

3.3 INSTALLATION OF CONDUITS
A. General: Install concealed conduits in new construction work, either in walls, slabs, or above hung ceilings. Run conduits concealed in existing work where practical or specifically indicated on the drawings.
   1. Mechanically fasten together metal conduits, enclosures, and raceways for conductors to form continuous electrical conductor. Connect to electrical boxes, fittings, and cabinets to provide electrical continuity and firm mechanical assembly.
   2. Avoid use of dissimilar metals throughout system to eliminate possibility of electrolysis. Where dissimilar metals are in contact, coat surfaces with corrosion inhibiting compound before assembling.
   3. Install miscellaneous fittings such as reducers, chase nipples, 3-piece unions, split couplings, and plugs that have been specifically designed and manufactured for their particular application. Install expansion fittings in raceways every 200' of linear run or wherever structural expansion joints are crossed.
B. Conduit Installation: Follow minimum requirements in all areas as follows:
   1. Use rigid steel galvanized conduit where exposed in the central plant, where exposed to weather or subject to saturation with liquids, and where exposed to potential mechanical damage. Also use rigid steel galvanized conduit for all risers from underground, except as allowed for conduits used for communications systems. All rigid elbows and rigid risers to cabinets shall be applied with bitumastic paint where below grade.

2. Use steel EMT above hung ceilings in offices, corridors, toilets, and other areas with hung ceilings. EMT may be used in mechanical and electrical rooms, except for the central plant and other areas requiring rigid steel galvanized conduit as in (1.) above.
3. Use PVC heavy wall direct buried rated (Schedule 40) when raceways run below grade, under floors on grade or in concrete. All bends and elbows greater than 45 degrees shall be galvanized rigid steel conduit. All risers from underground to cabinets and boxes when conduit is to be exposed shall be rigid steel conduit.
4. Underground telecommunications conduits for voice/data, fire alarm, intercom, and TV may be all direct buried rated Schedule 40 PVC.
5. Conduit in walls to recessed panels and boxes shall be in accordance with NEC. PVC up to first point of termination with 4'-0" maximum in wall and EMT above 4'-0".
6. Use flexible conduit in movable partitions and from outlet boxes to lighting fixtures, and final 24" of connection to motors, control items or any equipment subject to movement or vibration, and in cells of precast concrete panels. Flexible conduit shall not exceed 6 feet long.
7. Use liquid-tight flexible conduit where subjected to one or more of the following conditions:
   a. Exterior location.
   b. Moist or humid atmosphere where condensate can be expected to accumulate. Mechanical rooms.
   c. Corrosive atmosphere.
   d. Subjected to water spray or dripping oil, water, or grease, including kitchen equipment connections.
8. Use hot-dipped galvanized conduit where conduit is routed outdoors or in anyway exposed to weather.
9. Surface mounted raceways in finished areas are not permitted.
10. Electrical contractor will be responsible for the following for all underground conduits:
    a. Trenching and Excavation
    b. Backfill
    c. Compaction
    d. Entrances into and exits from buildings shall be underground, concealed. See Specification Sections 01731 and 01732.
11. MC cable shall not be permitted.

C. Cut conduits straight, properly ream, and cut threads for heavy wall conduit deep and clean.
D. Field bend conduit with benders designed for purpose so as not to distort nor vary internal diameter.
E. Minimum conduit size shall be 1/2" unless noted otherwise. Homeruns shall be a minimum 3/4".
F. Fasten conduit terminations in sheet metal enclosures by two (2) locknuts, and terminate with bushings and grounded. Install locknuts inside and out side enclosure.
G. Conduits are not to cross pipe shafts, or ventilating duct openings.
H. Keep conduits a minimum distance of 6" from parallel runs of flues, hot water pipes or other sources of heat. Wherever possible, install horizontal raceway runs above water and steam piping.
I. Use of running threads at conduit joints and terminations is prohibited. Where required, use 3-piece union or split coupling.
J. Complete installation of electrical raceways before starting installation of cables/wires within raceways.
K. Install conduits so as not to damage or run through structural members. Avoid horizontal or cross runs in building partitions or side walls.
L. Exposed Conduits in Unfinished Areas:
   1. Install exposed conduits and extensions from concealed conduit systems neatly, parallel with, or at right angles to walls of building.
   2. Install exposed conduit work as not to interfere with ceiling inserts, lights or ventilation ducts or outlets.
   3. Support all conduits by use of hangers, clamps, or clips. Support conduits on each side of bends and on spacing not to exceed following: up to 1": 6'-0"; 1-1/4" and over: 8'-0". All conduits shall be adequately supported to prevent any noticeable deflection, vibration or rattle.
   4. Run conduits for outlets on waterproof walls exposed. Set anchors for supporting conduit on waterproof wall in waterproof cement.
   5. Exposed conduits on the outside of buildings is not permitted.
M. Conduit Fittings:
   1. Construct locknuts for securing conduit to metal enclosure with sharp edge for digging into metal, and ridged outside circumference for proper fastening.
   2. Bushings for terminating conduits smaller than 1- 1/4" are to have flared bottom and ribbed sides, with smooth upper edges to prevent injury to cable insulation.
   3. Install insulated type bushings for terminating conduits 1-1/4" and larger. Bushings are to have flared bottom and ribbed sides. Upper edge to have phenolic insulating ring molded into bushing.
   4. All bushings of standard or insulated type to have screw type grounding terminal.
   5. Miscellaneous fittings such as reducers, chase nipples, 3-piece unions, split couplings, and plugs to be specifically designed for their particular application.
N. Concealed Conduits:

1. Metallic raceways installed underground or in floors below grade, or outside are to have conduit threads painted with corrosion inhibiting compound before couplings are assembled. Draw up coupling and conduit sufficiently tight to ensure watertightness.
2. Conduit in concrete slabs: Separate conduits by not less than diameter of largest conduit to ensure proper concrete bond. Conduits must have a minimum of three-quarter inch (3/4") concrete cover.
3. Embedded conduit diameter is not to exceed one-third (1/3) of slab thickness. Conduit shall not be run in slabs less than 3 inches thick.

O. Painting of Conduit & Boxes:
1. Fire Alarm: All new fire alarm conduit, including underground conduit, shall be spot painted red at a minimum of every 4 feet, nominally. Underground conduit shall be spot painted red after it is laid in trench and made up tight. All fire alarm junction boxes shall be painted red.
2. Intercom System: All new junctions boxes above ceiling shall be painted blue.
3. Instructional TV System: All new junction boxes above ceiling shall be painted green.
4. Security System: All new junction boxes above ceiling shall be painted yellow.
5. 208Y/120 volt Power: All new junction boxes above ceiling shall be painted brown.
6. 480Y/277 volt Power: All new junction boxes above ceiling shall be painted orange.
7. Emergency Power (if applicable): All new junction boxes above ceiling shall be painted pink.

P. Provide a continuous yellow marker tape with metallic tracer 6 inches above all new underground conduit.

Q. Underground Duct Banks and Underground Conduits: All underground conduits shall be installed per the National Electrical Code, in accordance with standard industry practices and in accordance with other sections of these specifications. Conduits in duct banks shall be neatly and securely installed in straight lines with manufactured elbows used for all turns and bends. Provide all required trenching, excavation, backfill, compaction, supports, manholes, etc. for a complete installation. Trenching, excavation, backfill and compaction shall be performed in accordance with applicable Division 2 and Division 3 sections of these specifications.
1. Coordinate routing of site raceways with all site piping including new chilled water piping and fire protection piping, plus existing sanitary, storm, and other site utilities. Hand dig in congested areas.

R. Low Voltage Control:
1. Mechanical contractor (Division 15) to provide and install all necessary wire and raceway (EMT conduit) for low voltage control such as thermostats, timers etc., unless specifically shown otherwise on the drawings. Raceways shall be installed in accordance with Division 16 sections. Final wire connections shall be by mechanical contractor.

3.4 INSTALLATION OF RACEWAYS AND WIREWAYS

A. General: Mechanically assemble metal enclosures, and raceways for conductors to form continuous electrical conductor, and connect to electrical boxes, fittings and cabinets as to provide effective electrical continuity and rigid mechanical assembly.
1. Avoid use of dissimilar metals throughout system to eliminate possibility of electrolysis. Where dissimilar metals are in contact, coat all surfaces with corrosion inhibiting compound before assembling.
2. Install expansion fittings in all raceways wherever structural expansion joints are crossed.
3. Make changes in direction of raceway run with proper fittings, supplied by raceway manufacturer. No field bends of raceway sections will be permitted.
4. Properly support and anchor raceways for their entire length by structural materials. Raceways are not to span any space unsupported. Supporting conduits from ceiling grid, other conduits, ductwork or other non-structural members will not be permitted.
5. Use boxes as supplied by raceway manufacturer wherever junction, pull or devices boxes are required. Standard electrical "handy" boxes, etc. shall not be permitted for use with surface raceway installations.
6. Provide watertight seals in all conduits which cross from one temperature to another temperature extreme, such as coolers and freezers.
7. All fire wall and smoke wall penetrations shall be sealed using a UL Listed fire stopping method. Method shall be submitted and approved by the Architect/Engineer.
8. All empty conduits shall have a 1/8” nylon pull rope installed, including all underground conduits.

3.5 COMMUNICATIONS SYSTEMS RACEWAY

A. Communications systems raceways shall be provided for each voice/data, fire alarm, or other system outlet or device indicated on the drawings.

END OF SECTION

SECTION 16120 - WIRES AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. This section is a Division-16 Basic Electrical Materials and Methods section, and is part of each Division-15 and -16 section making reference to electrical wires and cables specified herein.

1.2 DESCRIPTION OF WORK
- A. Extent of electrical wire and cable work is indicated by drawings and schedules.
- B. Types of electrical wire, cable, and connectors specified in this section include the following:
  1. Copper conductors.
  2. Fixture wires.
  3. Flexible cords and cables.
  4. Wirenut connectors.
- C. Applications of electrical wire, cable, and connectors required for project are as follows:
  1. For motor-branch circuits.
  2. For power distribution circuits
  3. For lighting circuits
  4. For appliance and equipment circuits

1.3 QUALITY ASSURANCE
- A. Manufacturers: Firms regularly engaged in manufacture of electrical wire and cable products of types, sizes, and ratings required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer's Qualifications: Firm with at least 3 years of successful installation experience with projects utilizing electrical wiring and cabling work similar to that required for this project.
- C. NEC Compliance: Comply with NEC requirements as applicable to construction, installation and color coding of electrical wires and cables.
- D. UL Compliance: Comply with applicable requirements of UL Std 83, "Thermoplastic-Insulated Wires and Cables", and Std 486A, "Wire Connectors and Soldering Lugs for Use with Copper Conductors".
- E. UL Compliance: Provide wiring/cabling and connector products which are UL-listed and labeled.
- F. NEMA/ICEA Compliance: Comply with NEMA/ICEA Std Pub/ No.'s WC 5, "Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy", and WC-30, "Color Coding of Wires and Cables", pertaining to electrical power type wires and cables.
- G. IEEE Compliance: Comply with applicable requirements of IEEE Stds 82, "Test Procedures for Impulse Voltage Tests on Insulated Conductors", and Std 241, "IEEE Recommended Practice for Electric Power Systems in Commercial Buildings" pertaining to wiring systems.
- H. ASTM Compliance: Comply with applicable requirements of ASTM B1, 2, 3, 8, and D-753. Provide copper conductors with conductivity of not less than 98% at 20oC (68oF).

PART 2 - PRODUCTS

2.1 AVAILABLE MANUFACTURERS
- A. Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
  1. Wire and Cable:
     a. American Wire and Cable Co.
     b. Anaconda-Ericsson Inc; Wire and Cable Div.
     c. Belden Div; Cooper Industries
  2. Connectors:
     a. AMP, Inc.
     b. Appleton Electric Co.
     c. Burndy Corporation
     d. Thomas and Betts Corp.

2.2 WIRES, CABLES, AND CONNECTORS
- A. General: Provide electrical wires, cables, and connectors of manufacturer's standard materials, as indicated by published product information; designed and constructed as recommended by manufacturer, for a

complete installation, and for application indicated. Except as otherwise indicated, provide copper conductors with conductivity of not less than 98% at 20oC (68oF).

B. Building Wires: Provide factory-fabricated wires of sizes, ampacity ratings, and materials for applications and services indicated. Where not indicated, provide proper wire selection as determined by Installer to comply with project's installation requirements, NEC and NEMA standards. Select from the following UL types, those wires with construction features which fulfill project requirements:
   1. Type THHN, THWN, THHW, XHHW, THHN/THWN: Unless otherwise indicated, all conductors for dry locations requiring a conductor temperature rating 75oC (167oF) or less. Insulation shall be flame retardant, moisture and heat resistant, thermoplastic. Conductor shall be annealed copper.
   2. Type THWN, THHW, XHHW, THHN/THWN: Unless otherwise indicated, all conductors for wet or dry locations requiring a conductor temperature rating of 75oC (167oF) or less. Insulation shall be flame retardant, moisture and heat resistant thermoplastic. Conductor shall be annealed copper.
   3. Type THHN, THHW, XHHW: Unless otherwise indicated, all conductors for dry locations requiring a conductor temperature rating of 90oC (194oF) or less. Insulation shall be flame retardant, moisture and heat resistant thermoplastic. Conductor shall be annealed copper.
   4. Type XHHW-2: Unless otherwise indicated, all conductors for wet locations requiring a conductor temperature rating of 90oC (194oF) or less. Insulation shall be flame retardant, moisture and heat resistant thermoplastic. Conductor shall be annealed copper.
   5. Conductors for use at 600 volts or below shall be 600 volt rated. Wire No. 12 and smaller may be solid or stranded and wire No. 10 and larger shall be stranded only. Stranded conductors shall terminate in crimp type lugs.
   6. Motor circuit branch wiring and associated control wiring: Provide type THHN insulation in dry and damp locations. Provide type THHW insulation in wet locations. All motor wiring to be stranded copper.
   7. Wiring in fluorescent fixture channels: Provide conductors with a 90°C temperature rating, type THHN or TFFN insulation.

C. Cables: Provide UL-type factory-fabricated cables of sizes, ampacity ratings, and materials and jacketing/sheathing as indicated for services indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements, NEC and NEMA standards.

D. Connectors:
   1. General: Provide UL-type factory-fabricated, metal connectors of sizes, ampacity ratings, materials, types and classes for applications and for services indicated. Where not indicated, provide proper selection as determined by Installer to comply with project's installation requirements, NEC and NEMA standards. Select from the following, those types, classes, kinds, and styles of connectors to fulfill project requirements:
      a. Type: Pressure.
      b. Class: Insulated.
      c. Kind: Copper (for Cu to Cu connection).
      d. Style: Butt connection.
      e. Style: Elbow connection.
      f. Style: Combined "T" and straight connection.
      g. Style: "T" connection.
      h. Style: Split-bolt parallel connection.
      I. Style: Tap connection.
      j. Style: Pigtail connection.
      k. Style: Wirenut connection.

PART 3 - EXECUTION

3.1 INSTALLATION OF WIRES AND CABLES

A. General: Install electrical cables, wires, and wiring connectors as indicated, in compliance with applicable requirements of NEC, NEMA, Ul, and NECA's "Standard of Installation", and in accordance with recognized industry practices.

B. Coordinate wire/cable installation work including electrical raceway and equipment installation work, as necessary to properly interface installation of wires/cables with other work.

C. Pull conductors simultaneously where more than one conductor is being installed in the same raceway.

D. Use pulling compound or lubricant, where necessary; compound used must not deteriorate conductor or insulation.

E. Use pulling means including, fish tape, cable, rope and basket weave or wire/cable grips which will not damage cables or raceway. Any cable damaged during installation shall be completely replaced.

F. Keep conductor splices to minimum. No joints shall be made in conductor except at junction boxes, outlet boxes or splice boxes. Newly installed conductors shall not be spliced unless specifically noted on the drawings. Splices shall not be permitted underground.

G. Install splices and tapes which possess equivalent-or-better mechanical strength and insulation ratings than conductors being spliced.
H. Use splice and tap connectors which are compatible with conductor material.
I. Tighten electrical connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Std 486A and B.
J. At least eight inches (8") of slack wire shall be left in every outlet box whether it be in use, or left for future use.
K. Color code wiring as follows:
    1. 120/208 volt, 3 phase, 4 wire: phase A-black, phase B-red, phase C-blue, neutral-white; ground conductor-green.
    2. 277/480 volt, 3 phase, 4 wire: phase A-brown, phase B-orange, phase C-yellow, neutral-gray; ground conductor-green.
L. Wire and cable boxes and reels shall bear the date of manufacture and must not bear dates by more than one year preceeding contract date.
M. Minimum conductor sizes, except as specifically identified on the drawings, shall be as follows:
    1. No. 12 - Branch circuits of any kind, except as specified otherwise below.
    2. No. 14 - Signal systems, fire alarm system, unless specifically noted otherwise.
    3. No. 10 - Exit light circuits, emergency circuits, security lighting, and exterior light circuits.

3.2 FIELD QUALITY CONTROL
A. Prior to energization, test wires and cables for electrical continuity and for short-circuits.

END OF SECTION

SECTION 16135 - ELECTRICAL BOXES AND FITTINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. This section is a Division-16 Basic Electrical Materials and Methods section, and is a part of each Division-16 section making reference to electrical wiring boxes and fittings specified herein.

1.2 DESCRIPTION OF WORK
- A. Extent of electrical box and associated fitting work is indicated by drawings and schedules.
- B. Types of electrical boxes and fittings specified in this section include the following:
  1. Outlet boxes
  2. Junction boxes
  3. Pull boxes
  4. Floor boxes
  5. Bushings
  6. Locknuts
  7. Knockout closures
  8. Manholes and handholes

1.3 QUALITY ASSURANCE
- A. Manufacturers: Firms regularly engaged in manufacture of electrical boxes and fittings, of types, sizes, and capacities required, whose products have been in satisfactory use in similar service for not less than 3 years.
- B. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects utilizing electrical boxes and fittings similar to those required for this project.
- C. NEC Compliance: Comply with NEC as applicable to construction and installation of electrical wiring boxes and fittings.
- D. UL Compliance: Comply with applicable requirements UL 50, UL 514-Series, and UL 886 pertaining to electrical boxes and fittings. Provide electrical boxes and fittings which are UL-listed and labeled.
- E. NEMA Compliance: Comply with applicable requirements of NEMA Stds/Pub No.'s OS1, OS2, and Pub 250 pertaining to outlet and device boxes, covers, and box supports.

PART 2 - PRODUCTS

2.1 FABRICATED MATERIALS
- A. Outlet Boxes: Provide galvanized coated flat rolled sheet-steel outlet wiring boxes, of shapes, cubic inch capacities, and sizes, including box depths as indicated, suitable for installation at respective locations. Construct outlet boxes with mounting holes, and with cable and conduit-size knockout openings in bottom and sides. Provide boxes with threaded screw holes, with corrosion-resistant cover and grounding screws for fastening surface and device type box covers, and for equipment type grounding.
  1. Recessed outlet boxes shall be a minimum 4” square by 2-1/2” deep with reducer ring for a standard outlet coverplate. Where surface mounted devices are necessary provide 2-1/2” x 4” x 2-1/2” deep box to fit a standard coverplate. Shallow boxes shall not be permitted for communications outlet boxes.
  2. Outlet Box Accessories: Provide outlet box accessories as required for each installation, including box supports, mounting ears and brackets, wallboard hangers, box extension rings, fixture studs, cable clamps and metal straps for supporting outlet boxes, which are compatible with outlet boxes being used to fulfill installation requirements for individual wiring situations. Choice of accessories is Installer's code-compliance option.
- B. Device Boxes: Provide galvanized coated flat rolled sheet-steel non-gangable device boxes, of shapes, cubic inch capacities, and sizes, including box depths as indicated, suitable for installation at respective locations. Construct device boxes for flush mounting with mounting holes, and with cable-size knockout openings in bottom and ends, and with threaded screw holes in end plates for fastening devices. Provide cable clamps and corrosion-resistant screws for fastening cable clamps, and for equipment type grounding.
  1. Recessed outlet boxes shall be a minimum 4” square by 2-1/2” deep with reducer ring for a standard outlet coverplate. Where surface mounted devices are necessary provide 2-1/2” x 4” x 2-1/2” deep box to fit a standard coverplate. Shallow boxes shall not be permitted for communications outlet boxes.
  2. Device Box Accessories: Provide device box accessories as required for each installation, including mounting brackets, device box extensions, switch box supports, plaster ears, and plaster board

expandable grip fasteners, which are compatible with device boxes being utilized to fulfill installation requirements for individual wiring situations. Choice of accessories is Installer's code-compliance option.

C. Available Manufacturers: Subject to compliance with requirements, manufacturers offering outlet boxes which may be incorporated in the work include, but are not limited to, the following:
   1. Appleton Electric;
   2. Bell Electric;
   3. Eagle Electric Mfg. Co.; Inc.
   4. Midland-Ross Corp.
   5. OZ/Gedney; General Signal Co.
   6. Pass and Seymour, Inc.
   7. RACO Div.; Harvey Hubbell Inc.
   8. Thomas & Betts Co.

D. Raintight Outlet Boxes: Provide corrosion-resistant cast-metal raintight outlet wiring boxes, of types, shapes and sizes, including depth of boxes, with threaded conduit holes for fastening electrical conduit, cast-metal face plates with spring hinged watertight caps suitably configured for each application, including face plate gaskets and corrosion-resistant plugs and fasteners.

E. Available Manufacturers: Subject to compliance with requirements, manufacturers offering raintight outlet boxes which may be incorporated in the work include, but are not limited to, the following:
   1. Appleton Electric;
   2. Crouse-Hinds Co.
   3. Bell Electric;
   4. Harvey Hubbell, Inc.
   5. OZ/Gedney; General Signal Co.
   6. RACO Div.

F. Junction and Pull Boxes: Provide galvanized code-gage sheet steel junction and pull boxes; with screw-on covers; of types, shapes and sizes, to suit each respective location and installation; with welded seams and equipped with stainless steel nuts, bolts, screws, and washers.

G. Available Manufacturers: Subject to compliance with requirements, manufacturers offering junction and pull boxes which may be incorporated in the work include, but are not limited to, the following:
   1. Appleton Electric; Emerson Electric Co.
   2. Arrow-Hart Div.; Crouse-Hinds Co.
   3. Electric; Square D Company
   4. OZ/Gedney; General Signal Co.
   5. Spring City Electrical Mfg. Co.

H. Available Manufacturers: Subject to compliance with requirements, manufacturers offering floor boxes which may be incorporated in the work include, but are not limited to, the following:
   1. Arrow-Hart Div.; Crouse-Hinds Co.
   2. Harvey Hubbell, Inc.
   3. Midland-Ross Corp.
   4. Spring City Electrical Mfg. Co.

I. Bushings, Knockout Closures, and Locknuts: Provide corrosion-resistant box knockout closures, conduit locknuts and malleable iron conduit bushings, offset connections, of types and sizes, to suit respective installation requirements and applications.

J. Available Manufacturers: Subject to compliance with requirements, manufacturers offering bushings, knockout closures, locknuts, and connectors which may be incorporated in the work include, but are not limited to, the following:
   1. Arrow-Hart Div.; Crouse-Hinds Co.
   2. Appleton Electric Co.; Emerson Electric Co.
   3. Bell Electric; Square D Co.
   4. Midland-Ross Corp.
   5. OZ/Gedney Co.; General Signal Co.

K. Manholes and Handholes: Manholes and handholes for exterior use shall be pre-cast concrete with steel traffic rated covers, as manufactured by Brooks or equal. Pre-manufactured composite type boxes (Quazite or approved equal) are permitted where suitable and rated for the use indicated. Manholes and handholes shall be the size necessary for the number of conduits and conductors indicated on the drawings which will enter the enclosure, plus the necessary capacity for the spare conduits and the associated estimated conductor fill. Provide manholes with the appropriate drainage and knockouts for conduits and other necessary access. Traffic covers shall be engraved with the appropriate identification, such as "ELECTRIC" or “COMMUNICATIONS”. Provide plastic protective grommet on all conduit ends for all communications systems conduit inside manholes. Fire alarm conduits shall be marked.

PART 3 - EXECUTION

3.1 INSTALLATION OF ELECTRICAL BOXES AND FITTINGS

A. General: Install electrical boxes and fittings as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in accordance with recognized industry practices to fulfill project requirements.

B. Coordinate installation of electrical boxes and fittings with wire/cable, wiring devices, and raceway installation work.

C. Provide weathertight boxes and fittings for interior and exterior locations exposed to weather or mois ture. Provide weatherproof boxes for all exterior outlet boxes for power and systems, including fire alarm and intercom system boxes.

D. Provide knockout closures to cap unused knockout holes where blanks have been removed.

E. Install electrical boxes in those locations which ensure ready accessibility to enclosed electrical wiring.

F. Avoid installing boxes back-to-back in walls. Provide not less than 24" (600 mm) separation.

G. Position recessed outlet boxes accurately to allow for surface finish thickness. All outlet boxes shall be provided with bracket support behind the box for additional structural support. Mounting boxes directly to the metal framing on one side only is not acceptable. Boxes shall be additionally supported on the back side.

H. Fasten electrical boxes firmly and rigidly to substrates, or structural surfaces to which attached, or solidly embed electrical boxes in concrete or masonry.

I. Outlet boxes shall be structurally supported to the metal studs using a back bracket or other additional means of support. Side mounted attachment only to the metal studs is not acceptable.

J. Each circuit in pull box shall be marked with a tag guide denoting panels which they connect to.

K. Manholes and handholes shall be installed for all underground conduit installations. The minimum number of manholes and handholes shall be as indicated on the drawings. The contractor shall provide any additional handholes or manholes necessary for ease of installation, code compliance or due to voluntary or required re-routing of the underground conduits at no additional cost to the Owner.

END OF SECTION

SECTION 16142 - ELECTRICAL CONNECTIONS FOR EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. This section is a Division-16 Basic Electrical Materials and Methods section, and is part of each Division-15 and 16 section making reference to electrical connections for equipment specified herein.

1.2 DESCRIPTION OF WORK
- A. Extent of electrical connections for equipment is indicated by drawings and schedules. Electrical connections are hereby defined to include connections used for providing electrical power to equipment.
- B. Applications of electrical power connections specified in this section include the following:
  1. From electrical source to motor starters.
  2. From motor starters to motors.
  3. To lighting fixtures.
  4. To grounds including earthing connections.
  5. To equipment of communication, CCTV and alarm systems.
- C. Electrical connections for equipment, not furnished as integral part of equipment, are specified in Division-15 and other Division-16 sections, and are work of this section.
- D. Motor starters and controllers, not furnished as integral part of equipment, are specified in applicable Division-16 sections, and are work of this section.
- E. Refer to Division-15 specification sections and drawings for motor starters and controllers furnished integrally with equipment; not work of this section. Connections to this equipment is work of this section.
- F. Junction boxes and disconnect switches required for connecting motors and other electrical units of equipment are specified in applicable Division-16 sections, and are work of this section.
- G. Raceways and wires/cables required for connecting motors and other electrical units of equipment are specified in applicable Division-16 sections, and are work of this section.
- H. Refer to other Division-16 and Division-15 sections for low voltage control system wiring; not work of this section.

1.3 QUALITY ASSURANCE
- A. Manufacturers: Firms regularly engaged in manufacture of electrical connectors and terminals, of types and ratings required, and ancillary connection materials, including electrical insulating tape, soldering fluxes, and cable ties, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer's Qualifications: Firm with at least 2 years of successful installation experience with projects utilizing electrical connections for equipment similar to that required for this project.
- C. NEC Compliance: Comply with applicable requirements of NEC as to type products used and installation of electrical power connections (terminals and splices), for junction boxes, motor starters, and disconnect switches.
- D. IEEE Compliance: Comply with Std 241, "IEEE Recommended Practice for Electric Power Systems in Commercial Buildings" pertaining to connections and terminations.
- E. ANSI Compliance: Comply with applicable requirements of ANSI/NEMA and ANSI/EIA standards pertaining to products and installation of electrical connections for equipment.
- F. UL Compliance: Comply with UL Std 486A, "Wire Connectors and Soldering Lugs for Use with Copper Conductors", including, but not limited to, tightening of electrical connectors to torque values indicated. Provide electrical connection products and materials which are UL-listed and labeled.
- G. ETL Compliance: Provide electrical connection products and materials which are ETL-listed and labeled.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS
- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
  1. AMP Incorporated
  2. Appleton Electric Co.
  3. Arrow-Hart Div., Crouse-Hinds Co.
  4. Burndy Corporation
  5. General Electric Co.
  6. Gould, Inc.
  7. Harvey Hubbell Inc.

8. Square D Company
9. Thomas and Betts Corp.

2.2 MATERIALS AND COMPONENTS

A. General: For each electrical connection indicated, provide complete assembly of materials, including but not necessarily limited to, pressure connectors, terminals (lugs), electrical insulating tape, electrical solder, electrical soldering flux, heat-shrinkable insulating tubing, cable ties, solderless wirenuts, and other items and accessories as needed to complete splices and terminations of types indicated.

B. Metal Conduit, Tubing, and Fittings:
   1. General: Provide metal conduit, tubing, and fit tings of types, grades, sizes, and weights (wall thicknesses) indicated for each type service. Where types and grades are not indicated, provide proper selection as determined by Installer to fulfill wiring requirements and comply with NEC requirements for raceways. Provide products complying with Division-16 basic electrical materials and methods section "Raceways", and in accordance with the following listing of metal conduit, tubing, and fittings:
      a. Rigid steel conduit.
      b. Rigid metal conduit fittings.
      c. Electrical metallic tubing.
      e. Liquid-tight flexible metal conduit.
      f. Liquid-tight flexible metal conduit fittings.
      g. Flexible metal conduit.
      h. Flexible metal conduit fittings.

C. Wires, Cables, and Connectors:
   1. General: Provide wires, cables, and connectors complying with Division-16 basic electrical materials and methods section "Wires and Cables".
   2. Wires/Cables: Unless otherwise indicated, provide wires/cables (conductors) for electrical connections which match, including sizes and ratings, of wires/cables which are supplying electrical power. Provide copper conductors with conductivity of not less than 98% at 20oC (68oF).
   3. Connectors and Terminals: Provide electrical con nectors and terminals which mate and match, including sizes and ratings, with equipment terminals and are recommended by equipment manufacturer for intended applications.

PART 3 - EXECUTION

3.1 INSPECTION

A. Inspect area and conditions under which electrical connections for equipment are to be installed and notify Contractor in writing of conditions detrimental to proper completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 INSTALLATION OF ELECTRICAL CONNECTIONS

A. Install electrical connections as indicated; in accordance with equipment manufacturer's written instructions and with recognized industry practices, and complying with applicable requirements of UL, NEC, and NECA's "Standard of Installation", to ensure that products fulfill requirements.

B. Coordinate with other work, including wires/cables, raceway and equipment installation, as necessary to properly interface installation of electrical connections for equipment with other work.

C. Connect electrical power supply conductors to equipment conductors in accordance with equipment manufacturer's written instructions and wiring diagrams. Mate and match conductors of electrical connections for proper interface between electrical power supplies and installed equipment.

D. Provide the following electrical work as work of this section, complying with requirements of Division 15 sections:
   1. Power supply wiring from power source to power connection on chiller, fans, air handling units, pumps, duct heaters, water heaters, air compressor, air dryer, and unit control panels. Include starters, disconnects, time clocks, receptacles and required electrical devices, except where specified as furnished, or factory-installed, by manufacturer. Make all final electrical connections.

E. Maintain existing electrical service and feeders to occupied areas and operational facilities, unless otherwise indicated, or when authorized otherwise in writing by Owner, or Architect/Engineer. Provide temporary service during interruptions to existing facilities. When necessary, schedule momentary outages for replacing existing wiring systems with new wiring systems. When that "cutting-over" has been successfully accomplished, remove, relocate, or abandon existing wiring as indicated.

F. Cover splices with electrical insulating material equivalent to, or of greater insulation resistivity rating, than electrical insulation rating of those conductors being spliced. No new conductors shall be spliced unless specifically noted on the drawings.

G. Prepare cables and wires, by cutting and stripping covering armor, jacket, and insulation properly to ensure uniform and neat appearance where cables and wires are terminated. Exercise care to avoid cutting through tapes which will remain on conductors. Also avoid "ringing" copper conductors while skinning wire.
H. Trim cables and wires as short as practicable and arrange routing to facilitate inspection, testing, and maintenance.
I. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturers published torque tightening values for equipment connectors. Accomplish tightening by utilizing proper torquing tools, including torque screwdriver, beam-type torque wrench, and ratchet wrench with adjustable torque settings. Where manufacturer's torquing requirements are not available, tighten connectors and terminals to comply with torquing values contained in UL's 486A.
J. Provide flexible conduit for motor connections, and other electrical equipment connections, where subject to movement and vibration.
K. Provide liquid-tight flexible conduit for connection of motors and other electrical equipment where subject to movement and vibration, and also where connections are subjected to one or more of the following conditions:
    1. Exterior location.
    2. Moist or humid atmosphere where condensate can be expected to accumulate.
    3. Corrosive atmosphere.
    4. Water spray.
    5. Dripping oil, grease, or water, including kitchen areas.

3.3 FIELD QUALITY CONTROL

A. Upon completion of installation of electrical connections, and after circuitry has been energized with rated power source, test connections to demonstrate capability and compliance with requirements. Ensure that direction of rotation of each motor fulfills requirement. Correct malfunctioning units at site, then retest to demonstrate compliance.

END OF SECTION

SECTION 16143 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. This section is a Division-16 Basic Electrical Materials and Methods section, and is part of each Division-16 section making reference to wiring devices specified herein.

1.2 DESCRIPTION OF WORK
- A. The extent of wiring device work is indicated by drawings and schedules. Wiring devices are defined as single discrete units of electrical distribution systems which are intended to carry but not utilize electric energy.
- B. Types of electrical wiring devices in this section include the following:
  1. Receptacles, including surge suppression type if applicable.
  2. Ground-fault circuit interrupters

1.3 QUALITY ASSURANCE
- A. Installer's Qualifications: Firm with at least 2 years of successful installation experience on projects utilizing wiring devices similar to those required for this project.
- B. NEC Compliance: Comply with NEC as applicable to installation and wiring of electrical wiring devices.
- C. UL Compliance: Comply with applicable requirements of UL 20, 486A, 498, and 943 pertaining to installation of wiring devices. Provide wiring devices which are UL-listed and labeled.
- D. IEEE Compliance: Comply with applicable requirements of IEEE Std 241, "Recommended Practice for Electric Power Systems in Commercial Buildings", pertaining to electrical wiring systems.
- E. NEMA Compliance: Comply with applicable portions of NEMA Stds Pub/No. WD 1, "General-Purpose Wiring Devices", WD 2, "Semiconductor Dimmers for Incandescent Lamps", and WD 5, "Specific,-Purpose Wiring Devices".
- F. FS Compliance: Comply FS W-C-596 (Series) and FS W-S-896 (Series) pertaining to electrical power connectors and toggle switches.

1.4 SUBMITTALS
- A. Product Data: Submit manufacturer's data on electrical wiring devices.
  1. Receptacles, including surge suppression type if applicable.
  2. Ground-fault circuit interrupters

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS
- A. Manufacturers: Subject to compliance with requirements, provide wiring devices of one of the following (for each type and rating of wiring device):
  1. Hubbell
  2. Arrow-Hart Div.
  3. Eagle Electric Co.
  4. Leviton
  5. Pass - Seymour

2.2 FABRICATED WIRING DEVICES
- A. General: Provide factory-fabricated wiring devices, in types, colors, and electrical ratings for applications indicated and which comply with NEMA Stds Pub/No. WD 1. Provide white color devices and brushed satin finish stainless steel coverplates, except as otherwise indicated; all color selections to be verified by Contractor with Architect/Engineer prior to ordering.
- B. Receptacles:
  1. Heavy-Duty Duplex: Provide specification grade duplex receptacles, 2-pole, 3-wire, grounding, 20-amperes, 125-volts, with metal plaster ears, design for side and back wiring with spring loaded, screw activated pressure plate, with NEMA configuration 5-20R unless otherwise indicated. Hubbell or equal.
  2. Ground-Fault Interrupters: Provide "feed-thru" type ground-fault circuit interrupters, with heavy-duty duplex receptacles, capable of protecting connecting downstream receptacles on single circuit, and of being installed in a 2-3/4" deep outlet box without adapter, grounding type UL-rated Class A, Group 1, rated 20 amperes, 120-volts, 60 Hz; with solid-state ground-fault sensing and indication; with 5

milliamperes ground-fault trip level; equip with NEMA configuration 5-20R. Device must have a positive trip identification and reset. Provide device to match the existing color of surrounding devices.
3. Special Receptacles: Special configuration receptacles shall be standard NEMA plug configuration as specified on the drawings or as required. Provide heavy duty, specification grade receptacles, with black nylon face and brushed satin stainless steel cover plate.

C. Switches:
1. Snap: Provide specification grade, general-duty flush single-pole, quiet type toggle switches, 20-amperes, 120-277 volts AC, with mounting yoke insulated from mechanism, equip with plaster ears, switch handle, and side-wired screw terminals.
2. 2-way: Provide specification grade, general-duty flush double-pole AC quiet switches, 20-amperes, 120-277 volts AC, with mounting yoke insulated from mechanism, equip with plaster ears, switch handles, side-wired screw terminals, with break-off tab features, which allows wiring with separate or common feed.
3. Three-way: Provide specification grade, general-duty flush 3-way AC quiet type switches, 20-amperes, 120-277 volts AC, with mounting yoke insulated from mechanism, equip with plaster ears, lock type switch handles, sidewired screw terminals, with break-off tab features, which allows wiring with separate or common feed.
4. Four-way: Provide specification grade, general-duty flush 4-way AC quiet switches, 20-amperes, 120-277 volts AC, with mounting yoke insulated from mechanism, equip with plaster ears, switch handles, side-wired screw terminals, with break-off tab features, which allows wiring with separate or common feed.
5. Touch Snap: Provide soft-touch snap switches, cap able of effortless-fingertip operation; single-pole AC quiet, with lighted rocker switch hangles; sidewired screw terminals for connecting copper-clad aluminum wire, 20-amperes, 120-277 volts rating. Equip with plaster ears.
6. Provide low voltage type manual on – auto off switches where indicated with occupancy (vacancy) sensor control.
7. Switches to be color shall be satin finish stainless steel coverplate.

2.3 WIRING DEVICE ACCESSORIES

A. Wallplates: Provide wallplates for single and combination wiring devices, of types, sizes, and with ganging and cutouts as required. Select plates which mate and match wiring devices to which attached. Construct with metal screws for securing plates to devices; screw heads colored to match finish of plates. Provide plates possessing the following additional construction features:
1. Material and Finish: 0.04" thick, type 302 satin finished stainless steel.

B. Outdoor receptacles that are in locations without protection from the weather shall be provide with a UL listed and approved “in-use” weatherproof cover, and shall be GFI protected. DO NOT use “in-use” type cover in damp locations.

2.4 occupancy sensors and daYLIGHT SENSORS

A. Occupancy sensors shall be dual technology type. Provide occupancy sensors in all spaces indicated on the drawings, and provide ceiling or switch type mounted where indicated. Sensors shall be the type suited for the location. Adjust locations and sensor type (long range where requied) for proper performance and as needed to correct any nuisance on or off actions. Sensors shall have adjustable sensitivity, adjustable time periods for on/off, and a test mode. Sensor shall be set at 15 minutes. Sensorswitch or equal by Wattstopper, Hubbell.
1. Coordinate sensor type with the the lighting control for manual on – auto off where required.

B. Digital timer switches shall be Wattstopper TS-400, or or equal by Sensorswitch.

PART 3 - EXECUTION

3.1 INSTALLATION OF WIRING DEVICES

A. Install wiring devices as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation", and in accordance with recognized industry practices to fulfill project requirements.

B. Coordinate with other work, including painting, electrical boxes and wiring work, as necessary to interface installation of wiring devices with other work.

C. Install wiring devices only in electrical boxes which are clean; free from excess building materials, dirt, and debris.

D. Install galvanized steel wallplates on any exposed surface mounted devices.

E. Install wallplates after painting work is completed.

F. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for wiring devices. Where manufacturer's torquing requirements are not

indicated, tighten connectors and terminals to comply with tightening torques specified in UL Stds 486A and B. Use properly scaled torque indicating hand tool.

G. Contractor to provide ground fault protective type receptacles for any location within 2'-0" of sinks or other source of water. Feed through protection from one ground fault protected receptacle on a circuit is not acceptable.

H. Mounting height of boxes for devices as shown on legend, unless otherwise noted on the plan. Refer to architectural drawings to avoid interferences with millwork. Where two or more devices are shown at the same location, use gang box and one face plate. Verify all device locations with Owner prior to rough-in. Exact device locations may be adjusted by the Owner to avoid interferences or for general convenience at no additional cost to the Owner.

3.2 PROTECTION OF WALLPLATES AND RECEPTACLES

A. Upon installation of wallplates and receptacles, advise Contractor regarding proper and cautious use of convenience outlets. At time of Substantial Completion, replace those items which have been damaged, including those burned and scored by faulty plugs.

3.3 GROUNDING

A. Provide equipment grounding connections for wiring devices, unless otherwise indicated. Tighten connections to comply with tightening torques specified in UL Std 486 A to assure permanent and effective grounds.

3.4 TESTING

A. Prior to circuitry, test wiring for electrical continuity, for short-circuits and for grounding. Ensure proper polarity of connections is maintained. Prior to energization, test wiring devices to demonstrate compliance with requirements.

3.5 Warranty

A. All wiring devices shall have a minimum one year parts and labor warranty.

END OF SECTION

SECTION 16150 - MOTOR CONTROLLERS AND CONTACTORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
- A. Drawings and general provisions of Contract including General and Division 1 Specification Sections, apply to work of this section.

1.2 SCOPE
- A. The work, apparatus and materials which shall be furnished under these specifications and accompanying drawings shall include all items specified hereinafter and shown on the drawings. All other materials necessary for the complete installation shall be furnished and installed by the Contractor to provide complete electrical systems as indicated on the drawings and as specified herein.
- B. Coordinate all required interlocks with Division 15. Motor starters shall contain the necessary auxiliary contacts and control coil voltage to interface with the HVAC temperature control system and fire alarm control system.

1.3 DESCRIPTION OF WORK
- A. Extent of motor controller work is indicated by drawings and schedules. Types of motor controllers specified in this section include the following:
  1. Manual motor starters.
  2. Combination disconnect/FVNR motor starters.

1.4 QUALITY ASSURANCE
- A. Manufacturers: General Electric, Square D, Allen Bradley.
- B. Installer's Qualifications: Firm with at least 3 years of successful installation experience on projects with electrical motor controller work similar to that required for this project.
- C. Codes and Standards:
  1. NEMA Compliance: Comply with applicable requirements of NEMA Standards Publications pertaining to motor controllers.
  2. UL Compliance and Labeling: Comply with applicable requirements of UL safety standards pertaining to motor controllers. Provide motor controllers and components which have been UL-listed and labeled.
  3. NEC Compliance: Comply with applicable requirements of NEC pertaining to construction and installation of motor controllers.

1.5 SUBMITTALS
- A. Product Data: Submit manufacturer's technical product data, including specifications and installation instructions, for each type of motor controller required. Include data substantiating that materials comply with requirements.

PART 2 - PRODUCTS

2.1 INDIVIDUAL MOTOR CONTROLLERS
- A. Manual motor starters for 115 volts, single phase motors one horsepower and smaller, shall be single pole, horsepower rated switches with thermal overload units and heaters. Starters shall be Allen-Bradley Bulletin 609, General Electric CR-101 or Square D Class 2510 with stainless steel cover plates.
- B. Magnetic full voltage starters for three phase motors shall be three pole, horsepower rated, magnetically operated with three electronic overloads sized for the specific motors supplied. Overload “heaters” are not permitted. Starters shall be Allen-Bradley Bulletin 509, General Electric CR-306 or Square D Class 8536. Provide Hand-Off-Auto selector switch, pilot lights to indicate starter's position (Amber - Red - Green), a minimum of two normally open and two normally closed auxiliary contacts, control power transformer fused on primary and secondary, control coil, and three overload heaters with reset button. Provide control power and coil voltage as required for interlock with the HVAC temperature control system and fire alarm system. Starters shall be the Nema size indicated on the drawings but shall be a minimum size one.
- C. Combination magnetic, full voltage starters for three phase motors shall be three pole horsepower rated, magnetically operated contacts, with three electronic overloads sized for the specific motors supplied. Overload “heaters” are not permitted. A three pole horsepower rated, fusible disconnect switch shall also be included integral within the enclosure. Provide fuses sized as recommended by the motor manufacturer. Starters shall be Allen-Bradley Bulletin 512, General Electric CR-308 or Square D Class 8538. Provide Hand-Off-Auto selector switch, pilot lights to indicate starter's position (Amber - Red - Green), a minimum of two normally open and two normally closed auxiliary contacts, control power transformer fused on primary and secondary, control coil, and three overload heaters with reset button. Provide control power and coil

voltage as required for interlock with the HVAC temperature control system and fire alarm system. Starters shall be the Nema size indicated on the drawings but shall be a minimum size one.

D. Provide enclosure type suitable for the environment in which it is installed. Enclosure shall be interlocked so the door cannot be opened without turning the unit off. This interlock shall be capable of being defeated by properly trained personnel.
E. Provide phase failure relay for all three phase motors. Relay shall be fully adjustable to open the contacts when any phase to phase or phase to ground voltage is above or below 20% nominal. The relay drop out point shall be adjustable from 0% to 50%. Relay shall be provided with an adjustable time delay of 0 to 120 seconds before opening to avoid nuisance outages. Relay shall be full automatic to open and fully automatic to reset.

PART 3 - EXECUTION

3.1 MOTOR CONTROLLERS, contactors AND ASSOCIATED CONTROLS

A. Unless otherwise indicated, motor controllers shown on the drawings shall be furnished and installed under this section. The full load current and starting characteristics of each motor shall be verified for proper selection of motor over load devices. The Contractor shall furnish and install all steel shapes, etc., necessary for a support of all motor controllers.
B. Unless otherwise indicated, all control devices, such as thermostats, firestats, etc., shall be installed in place and wired under other sections of the specifications. Coordinate required starter auxiliary contacts and coil voltages for a properly operational system.
C. Motor controllers shall be installed in accordance with all applicable NEC installation requirements.

3.2 IDENTIFICATION OF EQUIPMENT

A. Identification shall be provided for all motor controllers installed by the Contractor. Identification shall consist of white laminated plastic plates with black engraved letters.

END OF SECTION

SECTION 16170 - CIRCUIT AND MOTOR DISCONNECTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division-16 Basic Electrical Materials and Methods section, apply to work of this section.

1.2 DESCRIPTION OF WORK
- A. Extent of circuit and motor disconnect switch work is indicated by drawings and schedules.
- B. Types of circuit and motor disconnect switches in this section include the following:
  1. Equipment disconnects.
  2. Appliance disconnects.
  3. Motor-circuit disconnects.
- C. Wires/cables, raceways, and electrical boxes and fittings required in connection with circuit and motor disconnect work are specified in other Division-16 Basic Electrical Materials and Methods sections.

1.3 QUALITY ASSURANCE
- A. Manufacturers: Firms regularly engaged in manufacture of circuit and motor disconnect switches of types and capacities required whose products have been in satisfactory use in similar service for not less than 3 years.
- B. Installer's Qualifications: Firm with at least 3 years of successful installation experience with projects utilizing circuit and motor disconnect work similar to that required for this project.
- C. NEC Compliance: Comply with NEC requirements pertaining to construction and installation of electrical circuit and motor disconnect devices.
- D. UL Compliance: Comply with requirements of UL 98, "Enclosed and Dead-Front Switches". Provide circuit and motor disconnect switches which have been UL-listed and labeled.
- E. NEMA Compliance: Comply with applicable requirements of NEMA Stds Pub No. KS 1, "Enclosed Switches" and 250, "Enclosures for Electrical Equipment (1000 Volts Maximum)".

1.4 SUBMITTALS
- A. Product Data: Submit manufacturer's data on circuit and motor disconnect switches.
- B. Wiring Diagrams: Submit power and control wiring diagrams for circuit and motor disconnects including connections to power and control panels, and feeders.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS
- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering circuit and motor disconnects which may be incorporated in the work include the following:
  1. General Electric Co.
  2. Square D Company
  3. ITE/Seimens

2.2 FABRICATED SWITCHES
- A. Heavy-Duty Safety Switches: Provide surface-mounted, heavy-duty type, sheet-steel enclosed safety switches, of types, sizes and electrical characteristics indicated; fusible or non-fusible type as indicated, amperes as indicated, 60 Hz, 3-blades, 4-poles, solid neutral; and incorporating quick-make, quick-break type switches; construct so that switch blades are visible in OFF position with door open. Equip with operating handle which is integral part of enclosure base and whose operating position is easily recognizable, and is padlockable in OFF position; construct current carrying parts of high-conductivity copper, with silver-tungsten type switch contacts, and positive pressure type reinforced fuse clips. Provide NEMA Type 3R enclosures, where applicable. Provide grounding kit. Provide 240 volt rated switches for 208Y/120 volt systems and 600 volt rated switches for 277Y/480 volt systems.
  1. Fuses: Provide fuses for safety switches, sized as recommended by the manufacturer of the equipment to be protected, of classes, types, and ratings needed to fulfill electrical requirements for service indicated. Provide R-clips for all fuse holders.

PART 3 - EXECUTION

3.1 INSTALLATION OF CIRCUIT AND MOTOR DISCONNECT SWITCHES

A. Install circuit and motor disconnect switches as indicated, complying with manufacturer's written instructions, applicable requirements of NEC, NEMA, and NECA's "Standard of Installation", and in accordance with recognized industry practices.
B. Coordinate circuit and motor disconnect switch installation work with electrical raceway and cable work, as necessary for proper interface.
C. Install disconnect switches for use with motor-driven appliances, and motors and controllers within sight of controller position unless otherwise indicated.
D. Provide a nameplate indicating the equipment served and protected.

3.2 GROUNDING

A. Provide equipment grounding connections, sufficiently tight to assure a permanent and effective ground, for electrical disconnect switches where indicated.

3.3 FIELD QUALITY CONTROL

A. Subsequent to completion of installation of electrical disconnect switches, energize circuitry and demonstrate capability and compliance with requirements. Where possible, correct malfunctioning units at project site, then retest to demonstrate compliance; otherwise remove and replace with new units and retest.
B. Painting: repair all scratches to factory painted and primed finish with factory supplied touch-up paint.

END OF SECTION

SECTION 16180 - OVERCURRENT PROTECTIVE DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. This section is a Division-16 Basic Electrical Materials and Methods section, and is part of each Division-16 section making reference to overcurrent protective devices specified herein.

1.2 DESCRIPTION OF WORK
- A. Extent of overcurrent protective device work is indicated by drawings and schedules.
- B. Types of overcurrent protective devices in this section include the following:
  1. Circuit Breakers:
     a. Air, molded-case, for installation in panels.
     b. Air, molded-case, for individual, separately enclosed mounting.
     c. For installation in existing panels.
  2. Fuses:
     a. Class RK1 and RK5, dual-element time-delay.
- C. Refer to other Division-16 sections for cable/wire and connector work required in conjunction with overcurrent protective devices; not work of this section.

1.3 QUALITY ASSURANCE
- A. Manufacturers: Firms regularly engaged in manufacture of overcurrent protective devices, of types, sizes, and ratings required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer: Qualified with at least 5 years of successful installation experience on projects with electrical installation work similar to that required for project.
- C. NEC Compliance: Comply with NEC requirements as applicable to construction and installation of overcurrent protective devices.
- D. UL Compliance: Comply with applicable requirements of UL 489, "Molded-Case Circuit Breakers and Circuit-Breaker Enclosures", and UL 198D, "High-Interrupting-Capacity Class K Fuses". Provide overcurrent protective devices which have been UL-listed and labeled.
- E. NEMA Compliance: Comply with applicable requirements of NEMA Std Pub Nos. AB 1, AB 2, and SG 3 pertaining to molded-case and low-voltage power type circuit breakers.
- F. FS Compliance: Comply with Federal Specification W-C-375B/GEN pertaining to molded-case circuit breakers.

1.4 SUBMITTALS
- A. Product Data: Submit manufacturer's data on overcurrent protective devices, including: amperes, voltages and current ratings, interrupting ratings, current limitations, internal inductive and non-inductive loads, time-current trip characteristics curves, and mounting requirements.
- B. Maintenance Stock, Fuses: For types and ratings required, furnish additional fuses, amounting to one unit for every 5 installed units, but not less than one unit of each.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS
- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include the following:
  1. Circuit Breakers:
     a. General Electric Co.
     b. Square D Co.
     c. ITE/Seimens
  2. Fuses:
     a. Bussmann Div.; McGraw-Edison Co.
     b. Gould, Inc.
     c. Cefco

2.2 CIRCUIT BREAKERS
- A. General: Except as otherwise indicated, provide circuit breakers and ancillary components, of types, sizes, ratings, and electrical characteristics indicated, which comply with manufacturer's standard design,

materials, components, and construction in accordance with published product information, and as required for a complete installation.

B. Molded-Case Circuit Breakers: Provide factory assembled, molded-case circuit breakers of frame size indicated; rated 600 volts or 240 volts as required, 60 Hz, 3-poles with interrupting ratings as shown on drawings. Provide breakers with permanent thermal and instantaneous magnetic trips in each pole, and with fault-current limiting protection, ampere ratings as indicated. Construct with overcenter, trip-free, toggle-type operating mechanisms with quick-make, quick-break action and positive handle trip indication. Handle ties are not permitted. Provide push-to-trip button on cover for mechanical tripping circuit breakers. Construct breakers for mounting and operating in any physical position and operating in an ambient temperature of 40oC. Provide breakers with mechanical screw type removable connector lugs, AL/CU rated. Circuit breakers shall have the short circuit interrupting rated indicated on the drawings or as required for the short circuit current available.

C. Molded-Case Circuit Breakers for Installation in Existing Panelboards or Switchboards: Shall meet the same specifications as in Part B above. Shall be manufactured by the same manufacturer as the panelboard or switchboard. When the existing panel or switchboard style is obsolete and the existing circuit breaker type is not available the contractor shall provide a circuit breaker of similar type as existing. The breaker shall be provided with all the required mounting hardware to mount the breaker in the existing space. The breaker shall meet or exceed the ratings of the existing breakers.

D. Provide all accesories indicated on the drawings, including accesories indicated on the panel schedules, such as shunt trips, ground fault protection, undervoltage trips, etc. Accessories shall be manufactured by the same manufacturer as the circuit breaker.

2.3 FUSES

A. General: Except as otherwise indicated, provide fuses of types, sizes, ratings, and average time/current and peak let-through current characteristics indicated, which comply with manufacturer's standard design, materials, and construction in accordance with published product information, and with industry standards and configurations.

B. Class RK5 Dual-Element Time-Delay Fuses: Provide UL Class RK-5 dual element time-delay fuses rated 600 V, 60 Hz, amperes as required by the manufacturer of the equipment being protected, with 200,000 RMS symmetrical interrupting current rating for protecting motors.

C. Class RK1 Dual-Element Time-Delay Fuses: Provide UL Class RK-1 dual element time-delay fuses rated 600 V, 60 Hz, amperes as required by the manufacturer of the equipment being protected, with 200,000 RMS symmetrical interrupting current rating for protecting service entrance or as otherwise noted.

2.4 EXISTING EQUIPMENT

A. Circuit breakers to be installed in existing equipment shall be manufactured by the existing equipment manufacturer and shall have short circuit interrupting ratings equal to or greater than the existing breakers.

PART 3 - EXECUTION

3.1 INSTALLATION OF OVERCURRENT PROTECTIVE DEVICES

A. Install overcurrent protective devices as indicated, in accordance with manufacturer's written instructions and with recognized industry practices to ensure that protective devices comply with requirements. Comply with NEC and NEMA standards for installation of overcurrent protective devices.

B. Coordinate with other work, including electrical wiring work, as necessary to interface installation of overcurrent protective devices with other work.

C. Fasten circuit breakers without causing mechaincal stresses, twisting or misalignment being exerted by clamps, supports, or cabling.

D. Set field-adjustable circuit breakers for trip settings as indicated, subsequent to installation of units.

E. Install fuses, if any, in fused circuit breakers.

3.2 ADJUST AND CLEAN

A. Inspect circuit-breaker operating mechanisms for malfunctioning and, where necessary, adjust units for free mechanical movement.

3.3 FIELD QUALITY CONTROL

A. Prior to energization of overcurrent protective devices, test devices for continuity of circuitry and for short-circuits. Correct malfunctioning units, and then demonstrate compliance with requirements.

END OF SECTION

SECTION 16190 - SUPPORTING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. This section is a Division-16 Basic Electrical Materials and Methods section, and is a part of each Division-16 section making reference to electrical supporting devices specified herein.

1.2 DESCRIPTION OF WORK
- A. Extent of supports, anchors, sleeves, and seals is indicated by drawings and schedules and/or specified in other Division-16 sections.
- B. Types of supports, anchors, sleeves, and seals specified in this section include the following:
  1. Clevis hangers
  2. C-clamps
  3. I-beam clamps
  4. One-hole conduit straps
  5. Round steel rods
  6. Lead expansion anchors
  7. Toggle bolts
  8. Wall and floor seals
- C. Supports, anchors, sleeves, and seals furnished as part of factory-fabricated equipment, are specified as part of that equipment assembly in other Division-16 sections.

1.3 QUALITY ASSURANCE
- A. Manufacturers: Firms regularly engaged in manufacture of supporting devices, of types, sizes, and ratings required, whose products have been in satisfactory use in similar service for not less than 3 years.
- B. NEC Compliance: Comply with NEC requirements as applicable to construction and installation of electrical supporting devices.

PART 2 - PRODUCTS

2.1 MANUFACTURED SUPPORTING DEVICES
- A. General: Provide supporting devices which comply with manufacturer's standard materials, design and construction in accordance with published product information, and as required for complete installation; and as herein specified. Where more than one type of supporting device meets indicated requirements, selection is Installer's option.
- B. Supports: Provide supporting devices of types, sizes, and materials indicated; and having the following construction features:
  1. Clevis Hangers: For supporting 2" rigid metal con duit; galvanized steel; with 1/2" dia. hole for round steel rod; approximately 54 pounds per 100 units.
  2. Reducing Couplings: Steel rod reducing coupling, 1/2" x 5/8"; black steel; approximately 16 pounds per 100 units.
  3. C-Clamps: Black malleable iron; 1/2" rod size; approximately 70 pounds per 100 units.
  4. I-Beam Clamps: Black steel, 1-1/4" x 3/16" stock; 3/8" cross bolt; flange width 2"; approximately 52 pounds per 100 units.
  5. One-Hole Conduit Straps: For supporting 3/4" rigid metal conduit; galvanized steel; approximately 7 pounds per 100 units.
  6. Hexagon Nuts: For 1/2" rod size; galvanized steel; approximately 4 pounds per 100 units.
  7. Round Steel Rod: Black steel; 1/2" dia.; approximately 67 pounds per 100 feet.
  8. Offset Conduit Clamps: For supporting 2" rigid metal conduit; black steel; approximately 200 pounds per 100 units.
- C. Anchors: Provide anchors of types, sizes, and materials indicated, with the following construction features:
  1. Lead Expansion Anchors: 1/2", approximately 38 pounds per 100 units.
  2. Toggle Bolts: Springhead; 3/16" x 4", approximately 5 pounds per 100 units.
- D. Available Manufacturers: Subject to compliance with requirements, manufacturers offering anchors which may be incorporated in the work include, but are not limited to, the following:
  1. Abbeon Cal Inc.
  2. Ackerman Johnson Fastening Systems, Inc.
  3. Elcen Metal Products Co.
  4. Ideal Industries, Inc.

5. Joslyn Mfg. and Supply Co.
6. McGraw Edison Co.
7. Rawlplug Co., Inc.
8. Star Expansion Co.
9. Expansion Bolt Co.

E. Sleeves and Seals: Provide sleeves and seals, of types, sizes, and materials indicated, with the following construction features:
   1. Wall and Floor Seals: Provide factory-assembled watertight wall and floor seals, of types and sizes indicated; suitable for sealing around conduit, pipe, or buting passing through concrete floors and walls. Construct seals with steel sleeves, malleable iron body, neoprene sealing grommets and rings, metal pressure rings, pressure clamps, and cap screws.

F. U-Channel Strut Systems: Provide U-channel strut system for supporting electrical equipment, 12-gage hot-dip galvanized steel, of types and sizes indicated; construct with 9/16" dia. holes, 8" o.c. on top surface, with standard finish, and with the following fittings which mate and match U-channel.
   1. Fixture hangers
   2. Channel hangers
   3. Thinwall conduit clamps
   4. Rigid conduit clamps
   5. Conduit hangers
   6. U-bolts

G. Available Manufacturers: Subject to compliance with requirements, manufacturers offering channel systems which may be incorporated in the work include, but are not limited to, the following:
   1. Greenfield Mfg. Co.; Inc.
   2. Midland-Ross Corp.
   3. OZ/Gedney Div.; General Signal Corp.
   4. Power-Strut Div.; Van Huffel Tube Corp.
   5. Unistrut Div.; GTE Products Corp.

H. Pipe Sleeves: Provide pipe sleeves of one of the following:
   1. Sheet Metal: Fabricate from galvanized sheet metal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate sleeves from the following gage metal: 3" and smaller, 20-gage; 4" to 6", 16-gage; over 6", 14-gage.
   2. Steel Pipe: Fabricate from Schedule 40 galvanized steel pipe; remove burrs.
   3. Iron Pipe: Fabricate from cast-iron or ductile-iron pipe; remove burrs.
   4. Plastic Pipe: Fabricate from Schedule 80 PVC plas tic pipe; remove burrs.

I. Sleeve Seals: Provide sleeves for piping which penetrates foundation walls below grade, or exterior walls. Calk between sleeve and pipe with non-toxic, UL-classified calking material to ensure watertight seal.

PART 3 - EXECUTION

3.1 INSTALLATION OF SUPPORTING DEVICES

A. Install hangers, anchors, sleeves, and seals as indicated, in accordance with manufacturer's written instructions and with recognized industry practices to insure supporting devices comply with requirements. Comply with requirements of NECA and NEC for installation of supporting devices.

B. Coordinate with other electrical work, including raceway and wiring work, as necessary to interface installation of supporting devices with other work. Coordinate support locations with other structural and mechanical trades. Supports shall not be attached to mechanical or electrical piping, conduit, ductwork, ceiling grid system or any other non-structural member.

C. Install hangers, supports, clamps, and attachments to support piping properly from building structure. Arrange for grouping of parallel runs of horizontal conduits to be supported together on trapeze type hangers where possible. Install supports with spacings indicated and in compliance with NEC requirements.

END OF SECTION

SECTION 16195 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division-16 Basic Electrical Materials and Methods section apply to work specified in this section.

1.2 DESCRIPTION OF WORK
- A. Extent of electrical identification work is indicated by drawings and schedules.
- B. Types of electrical identification work specified in this section include the following:
  1. Electrical power, control, and communication conductors.
  2. Operational instructions and warnings.
  3. Equipment/system identification signs.

1.3 QUALITY ASSURANCE
- A. Manufacturers: Firms regularly engaged in manufacture of electrical identification products of types required, whose products have been in satisfactory use in similar service for not less than 3 years.
- B. NEC Compliance: Comply with NEC as applicable to installation of identifying labels and markers for wiring and equipment.
- C. UL Compliance: Comply with applicable requirements of UL Std 969, "Marking and Labeling Systems", pertaining to electrical identification systems.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS
- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering electrical identification products which may be incorporated in the work include, but are not limited to, the following:
  1. Brady, W.H. Co.

2.2 ELECTRICAL IDENTIFICATION MATERIALS
- A. General: Except as otherwise indicated, provide manufacturer's standard products of categories and types required for each application. Where more than single type is specified for an application, selection is Installer's option, but provide single selection for each application.

2.3 ENGRAVED PLASTIC-LAMINATE SIGNS
- A. General: Provide engraving stock melamine plastic laminate, complying with FS L-P-387, in sizes and thicknesses indicated, engraved with engraver's standard letter style of sizes and wording indicated, white face and black core plies (letter color) except as otherwise indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate.
  1. Thickness: 1/8", except as otherwise indicated.
  2. Fasteners: Self-tapping stainless steel screws or permanent rivets. Contact-type permanent adhesive will not be acceptable.

2.4 LETTERING AND GRAPHICS
- A. General: Coordinate names, abbreviations and other designations used in electrical identification work, with corresponding designations shown, specified or scheduled. Provide numbers, lettering, and wording as indicated or, if not otherwise indicated, as recommended by manufacturer or as required for proper identification and operation/maintenance of electrical systems and equipment.

PART 3 - EXECUTION

3.1 APPLICATION AND INSTALLATION
- A. General Installation Requirements:
  1. Install electrical identification products as indicated, in accordance with manufacturer's written instructions and requirements of NEC.
  2. Coordination: Where identification is to be applied to surfaces which require finish, install identification after completion of painting.
  3. Regulations: Comply with governing regulations and requests of governing authorities for identification of electrical work.

3.2 OPERATIONAL IDENTIFICATION AND WARNINGS

A. General: Wherever reasonably required to ensure safe and efficient operation and maintenance of electrical systems, and electrically connected mechanical systems and general systems and equipment, including prevention of misuse of electrical facilities by unauthorized personnel, install self-adhesive plastic signs or similar equivalent identification, instruction or warnings on switches, outlets and other controls, devices and doors of electrical enclosures. Where detailed instructions or explanations are needed, provide plasticized tags with clearly written messages adequate for intended purposes.

3.3 EQUIPMENT/SYSTEM IDENTIFICATION

A. General: Install engraved plastic-laminate sign on each major unit of electrical equipment in building; including central or master unit of each electrical system including communication/ control/signal systems, unless unit is specified with its own self-explanatory identification or signal system. Except as otherwise indicated, provide single line of text, 1/2" high lettering, on 1-1/2" high sign (2" high where 2 lines are required), black lettering in white field. Provide text matching terminology and numbering of the contract documents and shop drawings. Provide signs for each unit of the following categories of electrical work:
   1. Switchboard (including all individual circuit breakers and main breaker), panelboards (including all individual circuit breakers and main breaker on distribution panels), electrical cabinets, disconnect switches and enclosures.
   2. Access panel/doors to electrical facilities. Provide building disconnect signage as indicated on the drawings.
   3. Transformers
   4. Equipment disconnects and starters.
   5. Timeclocks, contactors and lighting controls.
   6. Other control stations, such as purge fans, etc.

B. Install signs at locations indicated or, where not otherwise indicated, at location for best convenience of viewing without interference with operation and maintenance of equipment. Secure to substrate with fasteners, except use adhesive where fasteners should not or cannot penetrate substrate.

END OF SECTION

SECTION 16200 - ENGINE GENERATOR SET

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other related specification sections, apply to work of this section.

B. Division-16 Basic Electrical Requirements apply to work specified in this section.

1.2 DESCRIPTION OF SYSTEM

A. It is the intent of this specification to secure an emergency generator system that has been prototype tested, factory built, production tested, site tested, of the latest commercial design, together with all accessories necessary for a complete installation as shown on the plans and drawings and specified herein. The equipment supplied and installed shall meet the requirements of the National Electric Code and all applicable local codes and regulations. All equipment shall be new, of current production by a national firm which manufactures the generator and controls, transfer switch, and assembles the generator set as a matched unit so that there is one-source responsibility for warranty, parts, and service through a local representative with factory-trained service personnel.

1.3 SITE INSPECTION, TESTING, AND STARTUP:

A. After the generator sets have been installed they shall be tested at the site to assure they will function as specified.

B. The generator manufacturer shall include in his quote the cost of providing a qualified Startup Technician to assist the installing contractor in commissioning and performing the on-site testing of the generator. The price stall include 1 trip and a maximum of 5 working days. Additional days shall be quoted on a per diem basis.

C. The generator set manufacturer shall submit the on-site test procedure to the consulting engineer for approval prior to the actual testing. Included in the data submitted shall be copies of the blank test forms to be used for recording the test data.

D. The commissioning and testing shall include a minimum of 1 day of instruction in the maintenance and operation of the equipment.

E. The contractor shall notify the consulting engineer, operating personnel, and maintenance staff of the time and date of the on-site testing and training.

F. Upon completion and acceptance of the generator testing, the generator manufacturer shall furnish a report, for record, of all data and readings.

G. Instruct Owner on operation of the entire emergency power system, including transfer switches, fuel supply system, and engine-generators.

1.4 WARRANTY & MAINTENANCE

A. The generator shall be guaranteed against defective material and workmanship in accordance with the manufacturers published warranty for one year or 2,000 hours, whichever occurs first, from the date of the site start-up.

B. The generator manufacturer and his distributor shall maintain a 24-hour parts and service organization with available on-site response time of not more than 2 hours. This organization shall be regularly engaged in a maintenance contract program to perform preventive maintenance and service on equipment similar to the specified. A service agreement shall be available and shall include system operation under simulated operating conditions, adjustment to the generators as required and certification in the owner's maintenance log of repairs made and proper functioning of all systems.

1.5 DRAWINGS AND MANUALS

A. The systems manufacturer shall provide the necessary interconnection diagrams for connecting the engine generators to all other equipment related to the emergency generator system.

B. Six (6) sets of instruction manuals and record drawings shall be furnished for the engine generator sets and their accessories.

1.6 SUBMITTALS:

A. Submittal shall include specification sheets showing all standard and optional accessories to be supplied, schematic wiring diagrams, dimension drawings, and interconnection diagrams identifying by terminal number each required interconnection between the generator set, the transfer switch, and other remote devices if included elsewhere in these specifications

B. TESTING: To assure that the equipment has been designed and built to the highest reliability and quality standards, the manufacturer shall be responsible for design prototype tests as described herein:

Components of the emergency system, such as the engine/generator set, transfer switch, and accessories shall not be subjected to prototype tests since the tests are potentially damaging. Rather, similar design prototypes which will not be sold, shall be used for these tests. All certified test results shall be supplied to the Engineer if requested. Prototype test programs shall include the requirements of NFPA-110 and the following:

1. Maximum power (kw)
2. Maximum starting (kva) at 35% instantaneous voltage dip.
3. Alternator temperature rise by embedded thermocouple and by resistance method per NEMA MG1-22.40 and 16.40
4. Governor speed regulation under steady-state and transient conditions
5. Voltage regulation and generator transient response
6. Fuel consumption at 1/4, 1/2, 3/4, and full load
7. Harmonic analysis, voltage waveform deviation, and telephone influence factor.
8. Three-phase line-to-line short circuit test.
9. Cooling air flow.
10. Torsional analysis testing to verify that the generator set is Free of harmful torsional stresses.
11. Endurance testing

1.7 OPERATION AND MAINTENANCE MANUALS

A. Provide complete operation and maintenance manuals for the switchboard and circuit breakers. The manuals shall contain record as-built drawings of the generator sets, including wiring diagrams. The manuals shall contain complete operation and maintenance procedures and parts lists.

1.8 QUALITY ASSURANCE:

A. Installer's Qualifications: Firm with at least 5 years of successful installation experience on projects utilizing generator sets similar to that required for this project. Installer shall be a licensed electrician with experience installing at least three generator sets of equal size and scope. Generator set installers shall be approved and certified to install the supplied manufacturers equipment.

1.9 Codes and Standards:

A. The engine-generator sets shall be manufactured and installed in accordance with all applicable codes and standards, including but not limited to the following:
   1. NFPA 70 - National Electrical Code (NEC).
   2. NFPA-110 - Emergency and Standby Power Systems – current edition

1.10 MANUFACTURER

A. The manufacturer must have been in the electrical power generation business for at least ten years, and must maintain a national service organization available twenty-four hours a day through the year.
B. The generator set specified are that of Caterpillar. Catalog and model numbers are intended to establish the type and quality of equipment and system design as well as operating features required. Provide additional equipment and accessories for a complete and operational system.
   The following manufacturers shall be acceptable, subject to compliance with these specifications.
   1. Cummins/Onan.
   2. Kohler
C. Substitutions of acceptable manufacturer products proposed to be equal to those specified herein will be considered only when the following requirements have been met:
   1. A complete list of such substituted products, with drawings and data sheets.
   2. Substitute equipment and its capabilities must be a standard part of that systems current product line and must meet or exceed the capabilities of the equipment specified. Contractors are cautioned to conform to this specification so that the system provided will insure future options and priorities of the owner with regard to the systems use.
   3. Provide a reference list of five (5) installations within four (4) hours ground travel from this projects site, using the proposed substitute equipment which is considered to be a standard part of that product. The reference list shall include a one (1) paragraph narrative of each site's system, as well as site name, address, phone number and contact name with title of that site person. Each site included must have been completed and on line for a minimum of three (3) months.

PART 2 - PRODUCTS

2.1 GENERAL:

A. The standby diesel generator sets shall be rated standby power (defined as continuous operation for the duration of any power outage) 208Y/120 volts, 3 phase, 4 wire, .8 power factor, KW/KVA as indicated on the

drawings, at 3300 feet altitude, 104 degrees Fahrenheit, Caterpillar Model C15. Vibration isolators shall be provided between the engine-generator and welded steel base or between the base and the slab.

1. Generators shall comply with EPA/DEP regulations that apply at the time of the estimated shipping date. Provide copies of all required registrations and certifications with the project closeout documents.

B. Final Production Tests: Each generator set shall be tested under varying loads with guards and exhaust system in place. Tests shall include:
   1. Single-step load pickup
   2. Transient and steady-state governing
   3. Safety shutdown device testing
   4. Voltage regulation
   5. Rated Power
   6. Maximum Power

C. Upon request, arrangements to witness this test will be made or a certified test record will be sent prior to shipment.

2.2 ENGINE:

A. The engine shall deliver a minimum of bhp at a governed speed of 1800 rpm to deliver the rated KVA/KW. The engine shall be equipped with the following:
   1. Fuel shut-off valve.
   2. Electronic isochronous load sharing governor capable of +/-0.25% steady state frequency regulation over an operating range -40C to +85C.
   3. 24 volt positive engagement solenoid shift-starting motor.
   4. 40-ampere minimum automatic battery charging alternator with solid-state voltage regulation.
   5. Positive displacement, full pressure lubrication oil pump, cartridge oil filters, dipstick, and oil drain.
   6. Dry-type replaceable air cleaner elements.
   7. Engines requiring glow plugs will not be acceptable when NFPA-99 or NFPA-110 Type 10 (ten-second) transfer requirement must be met. Note: 10 second transfer must be met.
   8. The naturally aspirated or turbocharged engine shall be fueled with diesel fuel, and be liquid cooled. An appliance regulator and all associated fuel delivery accessories shall be provided with the generator. A unit-mounted radiator, blower fan, water pump, thermostat, and radiator duct flange (un-housed only) shall properly cool the engine with up to 0.5 inches H20 external static pressure on the cooling system.
   9. Engine shall be Tier III, or most current ratings in affect for this size engine for use as stand-by, DEP/EPA emissions approved and rated. Provide all required documentation, registrations and approvals. Provide approval and rating required at the time of shipping.

2.3 GENERATOR:

A. The alternator shall be salient-pole, re-connectable 10 lead, of 2/3 pitch to eliminate the third harmonic, self-ventilated of drip-proof construction with amortisseur rotor windings and skewed for smooth voltage waveform. 480Y/277 volt, 3 phase, 4 wire, 60 hertz, KW/ KVA per drawings, amp rating per drawings, at 130 degree C rise stand-by rating. The insulation material shall meet the NEMA standard (MGI-22.40 and 16.40) for Class H and be vacuum impregnated with epoxy varnish to be fungus resistant per MIL I-24092 or be multiply dipped and baked with nonhygroscopic varnish with a final dip of epoxy. The excitation system shall be of brushless construction controlled by a solid-state voltage regulator capable of maintaining voltage within + or - 0.5% at any constant load from 0 to 100% of rating.

B. The generator shall be capable of sustaining at least 250% of rated current for at least 10 seconds under a 3 phase symmetrical short by inherent design or by the addition of an optional current boost system.

C. The generator, having a single maintenance free bearing, shall be directly connected to the flywheel housing with a semi-flexible coupling between the rotor and the flywheel.

D. Gauge Panel: Set- mounted, NEMA 1 dead front, vibration isolated. Gauge panel shall include:
   1. Panel illuminating lights.
   2. Battery charging voltmeter.
   3. Coolant temperature gauge.
   4. Oil pressure gauge.
   5. Running time meter.
   6. Local emergency stop button.
   7. Dual element electronic speed switch with crank disconnect contact and overspeed contact shall be controlled by a magnetic pickup mounted radially to flywheel ring gear. Terminal blocks shall be provided for all engine/generator pre-alarms and safety shutdowns plus auxiliary functions for interconnect to engine/generator control cubicle. Each terminal shall be permanently marked to match the point to point wiring diagrams.
   8. Remote Annunciator: Remote annunciator shall be provided and mounted in the main electrical room. Provide all required conductors and conduit. The conduit shall be a minimum of 1-1/4".

9. Provide all other annunciation, monitoring and control required by EPA and DEP for the fuel system.

2.4 WIRING

A. All control wiring to the dry contacts located in the transfer shall be 18 gauge stranded wire for distances up to 1000 feet.

2.5 ACCESSORIES:

A. The following accessories shall be provided:
   1. Overvoltage protection will shut down the unit after one second of 15% or more overvoltage.
   2. Battery rack, battery cables, 12-volt battery(ies) capable of delivering the minimum cold-cranking amps required at zero degrees Fahrenheit per SAE Standard J-537.
   3. Gasproof, seamless, stainless steel, flexible exhaust connector(s) ending in pipe thread.
   4. Flexible fuel line(s) rated 300 degrees F and 100 PSI ending in pipe thread.
   5. Provide critical rated engine exhaust silencer, coated to be temperature and rust resistant, rated for critical applications. Exhaust noise shall be limited to 68 dba as measured at 10 feet in a free-field environment.
   6. Block heater of proper wattage and 480 volts, single phase, thermostatically controlled to maintain engine coolant at 90 degrees Fahrenheit (32 degrees Celcius) to meet the start-up requirement of NFPA-99 or NFPA-110 Regulations.
   7. 10-Ampere automatic float and equalize battery charger with +- 1% constant voltage regulation from no load to full load over +- 10% AC input line variation, current limited during engine cranking and short circuit conditions, temperature compensated for ambients from -40 degrees C to +60 degrees C, 5% accurate voltmeter and ammeter, fused, reverse polarity and transient protected. Battery charger shall have 120 volt input. Optional alarm circuit board to meet the requirements of NFPA-110 for low battery voltage, high battery voltage, and battery charger malfunction.
   8. Break-glass type remote emergency stop station which meets the requirements of NFPA-110. Provide required control circuit. Locate station adjacent to main service disconnect in the main electrical room.
   9. Provide 150 MPH, missile impact rated and critical sound attenuated, weatherproof enclosure. Enclosure shall be provided with a full length exterior galvanized steel cat-walk on each side of the generator enclosure along the long dimension, including stairs to a level walkway at the generator height above the fuel tank that allows access to all doors and compartments. See additional requirements in these specifications for the enclosure.
   10. Provide an integral in base fuel tank sized for 100% rated running load for 72 hours gallons of fuel, as a minimum. Tank shall be UL 142, double wall and shall include a leak detection, low fuel alarm and all required accessories, monitoring, alarms, and annunciation to meet EPA and DEP requirements. Tank shall be filled and topped off with fuel after testing.

2.6 GENERATOR ENCLOSURE:

A. Weather Resistant type enclosure shall be provided to house the engine/generator and accessories. The enclosure is to be in complete compliance with the National Electrical Code (NEC), and the National Fire Protection Association (NFPA) with regard to clearances around electrical equipment specified herein. The enclosure shall conform to the following construction and design criteria as set forth herein. Enclosure shall be manufactured by Advanced Manufacturing & Power Systems, Inc., DeLand, FL. (A.M.P.S.) Ph. (386) 822-5565. Substitutions must be submitted in writing to the engineer and be accepted as an approved equal prior to bid date.
   1. - Rigidity wind test equal to 180 MPH, or as required by ASCE-7
   2. - Roof load equal to 30 lbs. per sq. ft.
   3. - Rain test equal to 4" per hour
   4. -Florida Department of Business and Professional Regulation (DBPR) Modular Building Insignia
   5. -Large Missile Impact Resistant per FBC 1626.2 Testing Requirements with Approval Numbers.

B. Enclosure shall consist of a roof, two (2) side walls, two (2) end walls, and shall be manufactured of formed panel aluminum components. The enclosure is to be provided with a tiedown frame for securely attaching the entire structure to the concrete pad foundation as provided by the installing contractor.

C. Roof, sidewalls and end walls shall be of formed 0.090 marine grade aluminum panel construction. The roof is to be bolted to both side and end walls to form a complete weather and wind resistance assembly.

D. The radiator front face shall be sealed to the front wall utilizing a 2” minimum rubber gasket material to minimize recirculation of radiator air discharge and prevent the transmission of vibration from the packaged generator set to the enclosure.

E. Wall framing shall be incorporated in the panels by forming an open back box structure. Skin material shall be minimum thickness .090” marine grade aluminum. Enclosure shall have a painted finish for maximum corrosion resistance. Exterior skin panels shall be integral to the wall structure and not separate pieces riveted onto framing members. Wall panels shall be no wider than 36” each and shall be removable without

the use of special tools. Wall and roof panels shall be designed so that field replacement can be accomplished without disassembly of the entire structure if damage should occur.

F. A minimum of sixteen colors shall be available for enclosure exterior. Enclosure exterior color shall be WHITE unless otherwise specified.
G. Roof assembly shall be Cambered to aid in rain runoff. Roofs with thicknesses of less than 0.090" nominally shall not be considered. Roof assemblies are to be mechanically fastened to the vertical wall sections. Glued or crimped roofs shall not be allowed nor considered as an acceptable alternative.
H. Air handling shall be as follows: Air will enter the enclosure through a Hood, Plenum or Sound Attenuated Louvers/Baffles, as determined by the specific application and shall allow for at least 120% of total airflow demand for proper cooling to the generator set package. The cooling air Inlet system shall prevent water intrusion into the enclosure with the generator set operating at full rated load while allowing for a maximum air restriction of less than 0.25" H2O. Radiator discharge shall be through a gravity operated extruded aluminum backdraft type damper and into a vertical discharge plenum or hood. Discharge plenum/hood shall discharge air upward and be provided with a means to positively drain any and all water entering the discharge device. Air discharge devices shall in no event restrict airflow by more than 0.025" H2O. To ensure adequate airflow for cooling and combustion total static restriction over the entire system shall not exceed 0.50" H2O. Both Intake and Discharge shall be provided with removable bird/rodent screening to prevent the entrance of debris, birds, rodents and other vermin.
I. Acoustical insulation materials shall consist of a UL Classified Thermofiber® insulation material with a heat/fire resistance rating up to 2400º F and provide superior sound attenuation performance. Acoustical insulation material on interior roof and walls is to be mechanically held in place by 0.032" mill finished perforated aluminum with tuned engineered hole diameter for optimum sound attenuation at 1000 Hz. Interior perforated aluminum material shall protect the insulation material as well as allow noise to permeate the absorptive material.
J. Four-point lifting provisions shall be provided and have sufficient capacity suitable for rigging the entire assembly including all installed equipment.
K. A minimum of two (2) single personnel access doors shall be provided. Doors shall be manufactured of the same material as enclosure. Doors shall be fully gasketed to form a weather tight perimeter seal. Door hinges shall be full-length stainless steel piano type and shall be attached with stainless steel hardware. Door handles shall be of a corrosion resistant material and shall provide for a lockable, secure entry point into the enclosure. Doors shall be insulated with no less insulation than is provided in the enclosure walls for sound attenuation. Drip ledges are to be provided above each entry door and shall overhang the door on both sides by a minimum of 3".
L. Enclosure manufacturer shall provide all necessary hardware to internally or externally mount the exhaust silencer(s) specified herein. Silencer mounting hardware shall at all times maintain the Weather Resistant integrity of the enclosure system. If the silencer is mounted internally it will discharge upward into the radiator discharge plenum where possible, otherwise an aluminum rain collar and rain dress shield shall be provided by the enclosure manufacturer.
M. As a minimum the enclosure shall provide an average 15db(A) sound reduction as measured at one meter, five feet above grade level under free field conditions.
N. Enclosure must bear the Florida Department of Business and Professional Regulation (DBPR) Modular Building Insignia.
O. The Enclosure Components Shall be registered with the State of Florida and Have Approval Numbers to Certify the Enclosure Capable of Meeting the Requirements of the Florida Building Code for Large Missile Impact Resistance per Testing Section 1626.2.

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Examine areas and conditions under which engine-generator and components are to be installed, and notify Contractor in writing of conditions detrimental to proper completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

3.2 INSTALLATION:

A. Install generator on minimum 3" high concrete pad, (6" thick or as required by the manufacturer). Install vibration isolation.
B. The equipment shall be installed as shown on the plans, in accordance with the manufacturer's recommendations and all applicable codes. Except for the required field installation, and connections, the generator sets, transfer switches, and switchgear shall be shipped to the project site as a "single source" item for which responsibility for overall maintenance, spare parts, and service is available though a local factory distributor.

C. Site Tests: An installation check, start-up, 100% load bank test, and building load test shall be performed by the manufacturer's local representative. The engineer, regular operators, and the maintenance staff shall be notified of the time and date of the site test. The tests shall include:
   1. Fuel, lubricating oil, and antifreeze (liquid cooled models) shall be checked for conformity to the manufacturer's recommendations under the environmental conditions present and expected.
   2. Accessories that normally function while the set is standing by shall be checked prior to cranking the engine. This shall include: engine heaters, battery charger, generator strip heaters, remote annunciator, etc.
   3. Start-up under test mode to check for exhaust leaks, path of exhaust gases outside the building, cooling air flow, movement during starting and stopping, vibration during running, normal and emergency line-to-line voltage and phase rotation.
   4. Automatic start-up by means of simulated power outage to test remote-automatic starting, transfer of the load, and automatic shutdown. Prior to this test, all transfer switch timers shall be adjusted for proper systems coordination. Engine temperature, oil pressure and battery charge level along with generator voltage, amperes, and frequency shall be monitored throughout the test.
   5. Perform all tests required by the DEP and EPA in the presence of any required inspectors.
   6. Provide load bank for a 100% load test after installation on both generators.
   7. Test ground fault indication, as required.
D. Test all monitoring and annunciation equipment and obtain all DEP/EPA permits, inspections and approvals.

END OF SECTION

SECTION 16225 - AUTOMATIC TRANSFER SWITCHES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other related Specification sections, apply to work of this section.

B. Division-16 Basic Electrical Materials and Methods sections apply to work specified in this section.

1.2 DESCRIPTION OF SYSTEM

A. It is the intent of this specification to secure automatic transfer switches that has been prototype tested, factory built, production tested, and site tested, together with all accessories necessary for a complete installation as shown on the plans and drawings and specified herein. An automatic transfer switch with number of poles, voltage and current ratings as shown on the plans shall be provided. Each ATS shall consist of an inherently double-throw power transfer switch unit and a control module interconnected to provide complete automatic operation. All equipment shall be new and of current production by an international firm which manufactures the generator, controls, and transfer switch. The company selected will assemble the standby generator set and system as a matched unit so that there is one-source responsibility for warranty, parts and service through a local representative with factory-trained personnel.

1.3 WARRANTY & MAINTENANCE

A. The transfer switch shall be guaranteed against defective material and workmanship in accordance with the manufacturers published warranty to five (5) years from date of start-up.

B. The transfer switch manufacturer and his distributor shall maintain a 24-hour parts and service organization with available on-site response time of not more than 2 hours. This organization shall be regularly engaged in a maintenance contract program to perform preventive maintenance and service on equipment similar to the specified. A service agreement shall be available and shall include system operation under simulated operating conditions, adjustment to the generator transfer switch controls as required and certification in the owner's maintenance log of repairs made and proper functioning of all systems.

1.4 DRAWINGS AND MANUALS

A. The transfer switch manufacturer shall provide the necessary interconnection diagrams for connecting the generator to the automatic transfer switches, and other equipment related to the emergency generator system.

B. Six (6) sets of instruction manuals and record drawings shall be furnished for the transfer switches and their accessories.

1.5 SUBMITTALS:

A. Prior to manufacturing, the automatic transfer switch manufacturer shall provide 6 sets of submittals for approval. The following information shall be included in the automatic transfer switch submittal package: dimensional outline drawings, AC and DC schematics, master control schematics, catalog cuts of major items. Equipment interconnect diagrams shall be provided for all equipment prior to shipment.

B. Product Data: Submit manufacturer's data on automatic transfer switches including, but not limited to, voltages, number of phases, frequencies, and short-circuit and continuous current ratings. Provide complete data sheets indicating compliance with all the requirements stated herein.

C. Shop Drawings: Submit dimensioned layout drawings of automatic transfer switches showing accurately scaled basic equipment sections. Drawings shall be shown in plan and elevation. Bus arrangements shall be indicated.

1.6 OPERATION AND MAINTENANCE MANUALS

A. Provide complete operation and maintenance manuals for the automatic transfer switches. The manuals shall contain record as-built drawings of the automatic transfer switches, including wiring diagrams. The manuals shall contain complete operation and maintenance procedures and parts lists.

1.7 QUALITY ASSURANCE:

A. Installer's Qualifications: Firm with at least 5 years of successful installation experience on projects utilizing automatic transfer switch units similar to that required for this project. Installer shall be a licensed electrician with experience installing at least three automatic transfer switch units of equal size and scope.

1.8 DELIVERY, STORAGE, AND HANDLING:

A. Deliver automatic transfer switches and components properly packaged and mounted on pallets, or skids to facilitate handling of heavy items. Utilize factory-fabricated type containers or wrappings for automatic

transfer switches and components which protect equipment from damage. Inspect equipment to ensure that no damage has occurred during shipment.

B. Store automatic transfer switches in original packaging and protect from weather and construction traffic. Wherever possible, store indoors; where necessary to store outdoors, store above grade and enclose with watertight wrapping.

C. Handle automatic transfer switches carefully to prevent physical damage to equipment and components. Remove packaging, including the opening of crates and containers, avoiding the use of excessive hammering and jarring which would damage the electrical equipment contained therein. Do not install damaged equipment; remove from site and replace damaged equipment with new.

1.9 SEQUENCING AND SCHEDULING:

A. Schedule delivery of automatic transfer switches which permits ready building ingress for large equipment components to their designated installation spaces. Coordinate delivery of equipment with the installation of other building components.

B. Provide the size and location of concrete equipment pads, if applicable. Cast anchor bolt inserts into pad.

C. Coordinate with other electrical work including raceways, electrical boxes and fittings, and cabling/wiring work, as necessary to interface installation of automatic transfer switches with other work.

1.10 MANUFACTURER:

A. The automatic transfer switch and Standby Generator Set shall be provided as a system by the same manufacturer.

B. The manufacturer must have been in the electrical power generation business for at least ten years, and must maintain a national service organization available twenty-four hours a day through the year.

C. The automatic transfer switches specified are that of ASCO Power Technologies. Catalog and model numbers are intended to establish the type and quality of equipment and system design as well as operating features required. Provide additional equipment and accessories for a complete and operational system.

1. The following /manufacturer shall be acceptable as alternates.
   a. Russelectric

PART 2 - PRODUCTS

2.1 GENERAL

A. Automatic microprocessor transfer switches shall be 208 Volt, 3 Pole 3 Phase, 4 Wire, solidly connected neutral, NEMA 1, amperage as indicated on the plans, and shall include the following additional accessories:

B. The test switch shall be a two position maintained selector switch. The test position shall simulate a normal power outage and initiate the automatic transfer/retransfer sequence and will leave the ATS connected to the emergency source regardless of the condition of normal source. Should the emergency source fail, the ATS shall automatically return to normal

C. All time delays shall have a timing range of 0-99 minutes and be fully adjustable in increments of 1 second over the entire range. A dry contact kit shall be provided for remote indication. The contacts shall be SPDT and rated for 10 amperes at 125 VAC. The contacts shall indicate the following:

1. Contactor in the normal position
2. Contactor in the emergency position
3. Normal source available (as required in the "Source Voltages" section) Emergency source available (as required in "Source Voltages" section)
4. Transfer switch not in automatic operation Program selector switch not in the off position System alert (as required in the "System Status" section)

D. The transfer switch operation (from normal to emergency and from emergency to normal) shall be controlled manually by operating a switch to enable the transfer. An auto/manual switch shall be provided to select the mode of operation.

E. An in-phase monitor shall be provided as specified in the "In-phase Monitoring" section.

F. The transfer switch shall be capable of detecting over/under voltage and over/under frequency for both the normal and emergency sources.

G. The pick up and drop out settings shall be in 1% increments with an automatic differential of 2% between pick up and drop out settings.

H. The corresponding equivalent digital voltage and frequency shall be displayed. All settings shall be made with the door of the enclosure closed.

I. Anti-single phasing protection shall be provided on three phase systems. Single phasing shall be detected, even though a possible resultant regenerated voltage is within the parameters of the source sensing. A single phasing source shall be considered failed and the logic shall initiate a transfer to the alternate source when it is available.

J. Provide additional NO and NC contacts for monitoring from the energy management system.

2.2 Mechanical Requirements

A. The ATS shall be furnished in a NEMA Type 1 enclosure unless otherwise shown on the plans.
B. All moveable parts of the operating mechanism shall remain in positive mechanical contact with the main contacts during the transfer operation without the use of separate mechanical interlocks.
C. All main contacts shall be of silver composition. The main contacts shall be protected by arcing contacts in sizes 400 amperes and over.
D. Neutral conductors are to be solidly connected as shown on the plans, a neutral conductor terminal plate with fully rated AL-CU pressure connectors shall be provided.
E. All contacts, coils, springs, and control elements shall be conveniently removable from the front of the transfer switch without major disassembly or disconnection of power conductors. The contact transfer time shall not exceed one-sixth (1/6) of a second.

2.3 Electrical Requirements

A. Automatic transfer switches not intended for continuous duty or repetitive load transfer switching are not acceptable. The automatic transfer switch shall be rated in amperes for total system transfer including control of motors, electric-discharge lamps, electric heating, and tungsten-filament lamp load. Switches rated 400 amperes and below shall be suitable for 100% tungsten- filament lamp load.
B. The automatic transfer switch shall be rated to withstand the rms symmetrical short circuit current available at the automatic transfer switch terminals, with the type of overcurrent protection shown on the plans.
C. Provide withstand rating as noted on the drawings, minimum 35,000 AIC.

2.4 Transfer Switch Control System

A. The control module shall direct the operation of the transfer switch. The module's sensing and logic shall be a built-in microprocessor-based system for maximum reliability, minimum maintenance, and inherent digital communications capability. The control settings shall be stored in nonvolatile EEPROM. The module shall contain an integral programmable clock and calendar.
B. The control module shall have a keyed disconnect plug to enable the control module to be disconnected from the transfer mechanism for routine maintenance.
C. The control module shall be mounted separately from the transfer mechanism unit for safety and ease of maintenance. Interfacing relays shall be industrial control grade plug-in type with dust cover.
D. The control module shall include programming keypad, alpha-numeric display for monitoring settings and diagnostic values, key-lockable program selector switch, light-emitting diode status indication, and user instructions. These features shall be user accessible when the enclosure door is closed.
E. The control module shall be capable of storing the following records in memory
   1. Number of hours transfer switch is in the emergency position (total and since record reset).
   2. Number of hours the emergency is available (total and since record reset)
   3. Total days that control has been energized (total and since record reset)
   4. Total transfers in either direction (total and since record reset)
   5. Date of record reset
   6. Date of last exercise period
   7. Date, time, and description of the last four source failures
   8. Elapsed time during the most recent source outage
   9. Operation

2.5 Source Voltages

A. The voltage of each phase of the normal source and a single phase of the emergency source shall be monitored with pickup adjustable from 75% to 100% and dropout adjustable from 70% to 95% of nominal. Adjustment must be digital.
B. An automatic minimum differential of 2% shall be maintained between pickup and dropout settings.
C. Repetitive accuracy of the setting shall be ±2% or better over an operating temperature range of -20 F to 150 F (-29 C to 65.5 C).
D. The settings shall be fully field-adjustable by keypad or remote computer keyboard in increments of 1 Volt without opening the enclosure door and without the use of special tools or separate meters.
E. Factory settings shall be pickup at 90% and dropout at 85%.
F. A light-emitting diode shall indicate that normal and/or emergency voltage is within the set point parameter. The indication shall be viewable when the enclosure door is closed.

2.6 Time Delays

A. The control module shall include four time delays that are fully field-adjustable by keypad or keyboard in increments of 1 second over the entire range.
B. Adjustments and viewing of the time delay values shall be accessible when the enclosure door is closed.
C. Light emitting diodes shall indicate when the timing feature is running and when the time delay has ended.

2.7 Required Time Delays

A. Time delay for engine start to delay initiation of transfer for momentary source outages: Range 0-6 seconds. Factory set at 5 seconds.
B. Time delay for transfer to emergency: Range 0-5 minutes. Factory set at 5 seconds. Some loads may require an immediate transfer as soon as the generator is available. Coordinate with Owner during installation and set the time delay as required.
C. Time delay for transfer back to normal: Range 0-30 minutes. Factory set at 30 seconds.
D. Time delay for engine cool down: Range 0-30 minutes. Factory set at 5 minutes.
E. Input values outside the allowable parameters shall cause a "range error" message to be displayed.
F. The user shall have the ability to manually program an engine start and run for a period of up to 72 hours in the loaded or unloaded mode of operation. The time delay transfer to emergency and/or normal may be bypassed during the run period. A numeric indication shall be displayed of the run time remaining in hours and minutes. The run period may be stopped at any time with a single key stroke. After the run period has stopped, the engine shall run unloaded for the cool down time.
G. User terminals shall be available to connect a normally closed contact that, when opened, signals the control module to start and transfer load to the engine-generator. Closing these contacts shall initiate a retransfer and engine cool down sequence. The load shall be transferred to an available utility source immediately if the generator source should fail.
H. The following features shall be provided including the control module logic.
    1. Plant Exerciser: Programmable seven day, fourteen day or calendar exerciser. Each exerciser mode shall be capable of performing up to two exercise runs in up to five exercise event periods. The exerciser period shall be programmed with the enclosure door closed. The exercise time may be reset at any time with a single key stroke. The engine shall be allowed to run when the exercise period is terminated. Provide a separate exerciser for each generator.

2.8 MONITORING AND CONTROL

A. All phases of normal and all phases of emergency shall be monitored for over voltage and single phase of normal and emergency for over- and under-frequency. The values shall be programmed with the enclosure door closed.
B. Anti-single phasing protection shall detect regenerative voltage as a failed source condition.
C. In-phase monitoring shall be provided to continuously monitor the contactor transfer times, source voltage, frequency and phase angle to provide a self-adjusting, zero crossing contactor transfer signal to prevent back emf from tripping upstream or downstream breakers.
D. Status Indicators: Light-emitting diodes shall indicate the status of the following:
    1. Contactor Position
    2. System Status
    3. Transfer Switch Position Sensing Fault
    4. Transfer Switch Fail to Transfer
    5. Internal Control Module Fault
    6. External Fault Condition (two inputs)
    7. Not In Automatic
    8. Programming Switch Not In Off
E. The system status messages shall also be shown on the alpha-numeric display.
    1. Accessory Active
    2. Plant Exerciser
    3. In-Phase Monitor
F. A set of gold-flashed contacts rated 10 amps, 28VDC shall be provided for a low-voltage engine start signal when the normal source fails.

2.9 Compliance With Codes and Standards

A. The ATS shall conform to the requirements of:
    1. UL 1008-Standard for Automatic Transfer Switches
    2. NFPA 70-National Electrical Code, including use in emergency and standby systems in accordance with Articles 517, 700
    3. NFPA 110-Standard for Emergency and Standby Power Systems
    4. IEEE Standard 446-Recommended Practice for Emergency and Standby Power Systems (Orange Book)
    5. IEEE Standard 241-Recommended Practice for Electric Power Systems in Commercial Buildings (Gray Book)
    6. NEMA Standard ICS 2-447 Automatic Transfer Switches.

2.10 Withstand Ratings

A. The ATS shall be rated to withstand the available rms symmetrical short-circuit current at the ATS terminals with the type of overcurrent protection shown on the plans.

B. The control panel shall meet or exceed the voltage surge withstand capability in accordance with IEEE Standard 472-1974 (ANSI C37.90a-1974) and the impulse withstand voltage test in accordance with the proposed NEMA Standard ICS 1-109.
C. The control panel shall conform to the test requirements of UL 991 for transient overvoltage, electromagnetic susceptibility, and electrostatic discharge.

PART 3 - EXECUTION

3.1 Test and Certification
A. All production units shall be subjected to the following factory tests:
1. The complete ATS shall be tested to ensure proper operation of the individual components and correct overall sequence of operation and to ensure that the operating transfer time, voltage, frequency and time delay settings are in compliance with the specification requirements.
2. The switch shall be subjected to a dielectric strength test per NEMA Standard ICS 1-109.21.
B. The transfer switch shall be fully operational tested with the complete emergency system operating, including generator and fuel system.

3.2 Manufacturer's Responsibility
A. The supplier shall provide the services of a field technician to test and demonstrate and train the operating personnel. The training shall be as required to provide the Owner with the hands-on capability to control and troubleshoot the system.
B. The Architect/Engineer shall witness the demonstration of the system. Notification shall be provided one week prior to the test and demonstration.
C. Submittal shall include specification sheets showing all standard and optional accessories to be supplied: schematic, wiring diagrams, dimension drawings, and interconnection diagrams identifying by terminal number each required interconnection between the generator set and the transfer switch.
D. Each transfer switch shall be provided with an operator's manual providing installation and operating instructions. Each automatic transfer switch and generator set shall be warranted by the generator set manufacturer for one year from the date accepted by the Owner.

END OF SECTION

SECTION 16450 - GROUNDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division-16 Basic Electrical Materials and Methods section apply to work of this section.

1.2 DESCRIPTION OF WORK
- A. Extent of grounding work is indicated by drawings and schedules.
- B. Types of grounding specified in this section include the following:
  1. Solid grounding
- C. Applications of grounding work in this section including the following:
  1. Underground metal water piping
  2. Metal building frames
  3. Grounding electrodes
  4. Grounding rods
  5. Service equipment
  6. Enclosures
  7. Equipment
  8. Communications systems

1.3 QUALITY ASSURANCE
- A. Manufacturers: Firms regularly engaged in manufacture of electrical connectors, terminals and fittings, of types and ratings required, and ancillary grounding materials, including stranded cable, copper braid and bus, ground rods and plate electrodes, whose products have been in satisfactory use in similar service for not less than 3 years.
- B. Installer: Qualified with at least 3 years of successful installation experience on projects with electrical grounding work similar to that required for project.
- C. NEC Compliance: Comply with NEC requirements as applicable to materials and installation of electrical grounding systems, associated equipment and wiring. Provide grounding products which are UL-listed and labeled.
- D. UL Compliance: Comply with applicable requirements of UL Standards Nos. 467 and 869 pertaining to electrical grounding and bonding.
- E. IEEE Compliance: Comply with applicable requirements of IEEE Standard 142 and 241 pertaining to electrical grounding.

1.4 SUBMITTALS
- A. Product Data: Submit manufacturer's data on grounding systems and and accessories.
- B. Shop Drawings: Submit layout drawings of grounding systems and accessories including, but not limited to, ground wiring, copper braid and bus, ground rods, and plate electrodes.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS
- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering grounding products which may be incorporated in the work include, but not limited to, the following:
  1. Burndy Corp.
  2. Crouse-Hinds Co.
  3. Electrical Components Div.; Gould Inc.
  4. Thomas and Betts Corp.

2.2 GROUNDING SYSTEMS
- A. Materials and Components:
  1. General: Except as otherwise indicated, provide electrical grounding systems indicated; with assembly of materials, including, but not limited to, cables/wires, connectors, terminals (solderless lugs), grounding rods/electrodes and plate electrodes, bonding jumper braid, surge arresters, and additional accessories needed for complete installation. Where more than one type unit meets indicated requirements, selection is Installer's option. Where materials or components are not indicated, provide products complying with NEC, UL, IEEE, and established industry standards for applications indicated.

B. Conductors: Unless otherwise indicated, provide electrical grounding conductors for grounding connections matching power supply wiring materials and sized according to NEC.
C. Ground Rods: Solid copper or copper clad, minimum 3/4" dia. x 10'. Provide longer rods if necessary for required resistivity.
D. Electrical Grounding Connection Accessories: Provide electrical insulating tape, heat-shrinkable insulating tubing, welding materials, bonding straps, as recommended by accessories manufacturers for type services indicated.

PART 3 - EXECUTION

3.1 INSPECTION
A. Installer must examine areas and conditions under which electrical grounding connections are to be made and notify Contractor in writing of conditions detrimental to proper completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 INSTALLATION OF ELECTRICAL GROUNDING
A. General: Install electrical grounding systems where shown, in accordance with applicable portions of NEC, with NECA's "Standard of Installation", and in accordance with recognized industry practices, to ensure that products comply with requirements and serve intended functions.
B. Coordinate with other electrical work as necessary to interface installation of electrical grounding system work with other work.
C. Install clamp-on connectors only on thoroughly cleaned metal contact surfaces, to ensure electrical conductivity and circuit integrity.
D. All ground connections to water service entrance shall be installed to be exposed and visible for inspection at all times. Insulation shall not be installed over ground connections.
E. A water pipe, by itself, is not an adequate grounding electrode and must be supplemented by dual grounding electrodes, a minimum of 8 feet apart, and effectively bonded together. The supplemental ground shall be per Code with the "Footing type electrode" installed as required by current National Electrical Code. Provide a new service entrance grounding electrode system including bonding to metallic cold water pipe, structural steel and building re-bar, if available.
F. All ground connections shall be made on surfaces which have been cleaned of all paint, dirt, oil, etc., so that connections are bare metal to bare metal contact. All ground connections shall be tight and shall be made with U.L. listed grounding devices, fittings, bushings, etc.
G. Duplex receptacles of any amperage shall be grounding type and shall have a separate grounding contact. A separate jumper shall be installed between the grounding terminal on the device and the metallic box. The Contractor may provide U.L. listed self-grounding receptacles in lieu of providing the separate jumper.
H. Single and duplex receptacles shall have all grounded metal mechanically bonded together. Pressure bonding only is not acceptable.
I. All receptacles in kitchens and shops will be installed with the grounding contacts up.
J. In all cases where flexible metallic conduit, nonmetallic rigid conduit or liquid tight flexible conduit is used, a green wire ground conductor shall be used to provide ground continuity between the equipment of device and the conduit raceway system.
K. Provide a separate green wire ground conductor for each branch circuit originating from each panelboard. This ground shall be used to ground the device or load fed, and shall be bonded to components of the raceway system, such as junction boxes, starter or disconnect switch enclosures, equipment cases, etc. The green wire ground conductor shall terminate in the panelboard at the green wire ground bus. Ground conductors for branch circuits shall be of size indicated in NEC, except minimum size ground conductor shall be No. 12 AWG.
L. Each branch feeder originating at the switchboard(s) shall have a green wire ground conductor originating at the ground bus in the switchboard and terminating at the green wire ground bus in the panelboard. This green wire ground conductor shall be of size indicated in NEC except in no instance smaller than No. 8 AWG.
M. The green wire ground conductor is in addition to the neutral conductor and in no case shall the neutral conductor serve as the grounding means.
N. Multiple conductors in a single lug not permitted. Each grounding conductor shall terminate in its own terminal lug.
O. Grounding connections shall be tested and certified by the installer. The service entrance ground and each building ground shall have a maximum of 5 ohms resistance to ground. Supplemental grounding shall be provided if necessary.

END OF SECTION

SECTION 16470 - PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division-16 Basic Electrical Materials and Methods section apply to work specified in this section.

1.2 DESCRIPTION OF WORK
- A. Extent of panelboard, load-center and enclosure work, including cabinets and cutout boxes is indicated by drawings and schedules.
- B. Types of panelboards and enclosures in this section include the following:
  1. Service-entrance panelboards
  2. Power-distribution panelboards
  3. Lighting and appliance panelboards
- C. Refer to other Division-16 sections for cable/wire, connectors, and electrical raceway work required in conjunction with panelboards and enclosures; not work of this section. Refer to Section 16180 - Overcurrent Protective Devices for circuit breakers to be installed in panelboards.

1.3 QUALITY ASSURANCE
- A. Manufacturers: Firms regularly engaged in manufacture of panelboards and enclosures, of types, sizes, and ratings required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer's Qualifications: A firm with at least 3 years of successful installation experience on projects utilizing panelboards similar to that required for this project.
- C. NEC Compliance: Comply with NEC as applicable to installation of panelboards, cabinets, and cutout boxes. Comply with NEC requirements pertaining to installation of wiring and equipment in hazardous locations.
- D. UL Compliance: Comply with applicable requirements of Std No. 67 "Electric Panelboards:, and Stds No.'s 50, 869, 486A, 486B, and 1053 pertaining to panelboards, accessories and enclosures. Provide units which are UL-listed and labeled.
- E. NEMA Compliance: Comply with NEMA Stds Pub/No. 250, "Enclosures for Electrical Equipment (1000 Volts Maximum), Pub/ No. PB 1, "Panelboards", and Pub/No. PB 1.1, "Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less".
- F. Federal Specification Compliance: Comply with FS W-P-115, "Power Distribution Panel", pertaining to panelboards and accessories.

1.4 SUBMITTALS
- A. Product Data: Submit manufacturer's data on panelboards. Data must include a complete panel layout indicating the circuit breakers and corresponding circuit numbers. Include ratings of each circuit breaker including short circuit capability. Indicate all options to be supplied with the panelboard. Indicate overall panelboard bus rating and main type and rating. Show complete dimensional information. Any deviation from dimensions shown on the drawings shall be specifically pointed out in the submittal. Indicate the panelboard short circuit capacity rating and specify if this is fully rated or a series rating. Series ratings shall be completely documented with test results proving series rating capabilities included in the submittal. Clearly indicate the panel name for each submittal.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS
- A. Manufacturers: Subject to compliance with requirements, provide panelboard products of one of the following (for each type and rating of panelboard and enclosure):
  1. Square D Company
  2. General Electric Company
  3. ITE/Seimens
  4. Cutler Hammer
- B. All circuit breakers shall be the bolt-on type.

2.2 PANELBOARDS
- A. General: Except as otherwise indicated, provide panelboards, enclosures and ancillary components, of types, sizes, and ratings indicated, which comply with manufacturer's standard materials; design and construction in accordance with published product information; equip with proper number of unit panelboard

devices as required for complete installation. Where types, sizes, or ratings are not indicated, comply with NEC, UL, and established industry standards for those applications indicated.

B. Power Distribution Panelboards: Provide dead-front safety type power distribution panelboards as indicated, with panelboard switching and protective devices in quantities, ratings, types, and with arrangement shown; with anti-turn solderless pressure type main lug connectors approved for copper conductors. Select unit with feeder connecting at top of panel. Equip with copper bus bars with not less than 98% conductivity, and with full-sized neutral bus; provide suitable lugs on neutral bus for outgoing feeders requiring neutral connections. Provide bolt-on type molded-case main and branch circuit-breaker types for each circuit, with toggle handles that indicate when tripped. Where multiple-pole breakers are indicated, provide with common trip so overload on one pole will trip all poles simultaneously. Provide panelboards with bare uninsulated copper grounding bars suitable for bolting to enclosures. Select flush or surface mounted type enclosures, required on the drawings, fabricated by same manufacturer as panelboards, which mate properly with panelboards. Distribution panels shall be a power distribution type panel, such as Square D I-Line, GE Spectra Series, or equal.

C. Lighting and Appliance Panelboards: Provide dead-front safety type lighting and appliance panelboards as indicated, with switching and protective devices in quantities, ratings, types, and arrangements shown; with anti-burn solderless pressure type lug connectors approved for copper conductors; construct unit for connecting feeders at top of panel; equip with copper bus bars, full-sized neutral bar, with bolt-in type heavy-duty, quick-make, quick-break, single-pole or multi-pole circuit-breakers, with toggle handles that indicate when tripped. Provide suitable lugs on neutral bus for each outgoing feeder required; provide bare copper uninsulated grounding bars suitable for bolting to enclosures. Select enclosures fabricated by same manufacturer as panelboards, which mate properly with panelboards. Loadcenters are not acceptable.,

D. Panelboard Enclosures: Provide galvanized sheet steel cabinet type enclosures, in sizes and NEMA types as indicated, code-gage, minimum 16-gage thickness. Construct with multiple knockouts and wiring gutters. Provide fronts with wire gutters and without multiple knockouts. Provide fronts with adjustable trim clamps, doors with flush locks and keys, all panelboard enclosures keyed alike, with concealed piano door hinges. Equip with interior circuit-directory frame, and card with clear plastic covering. Provide baked gray enamel finish over a rust inhibitor coating. Design enclosures for flush recessed or surface mounting, as indicated on the drawings. Provide enclosures which are fabricated by same manufacturer as panelboards, which mate properly with panelboards to be enclosed.

E. Panelboard Accessories: Provide panelboard accessories and devices including, but not necessarily limited to, cartridge and plug time-delay type fuses, circuit-breakers, ground-fault protection units, etc., as recommended by panelboard manufacturer for ratings and applications indicated. All panelboards shall be provided with a separate copper ground bus bar.

F. Panelboard Ratings: All branch circuit panelboards shall be fully rated or series rated for the short circuit current indicated or the specific rating specified on the panel schedule, whichever is greater. Service entrance and distribution panelboards shall be fully rated for the short circuit current indicated or the specific rating specified on the panel schedule, whichever is greater. Series ratings will not be acceptable for service entrance or distribution panels. When series ratings are claimed, complete manufacturers data shall be submitted for verification of the series ratings claimed.

G. Breakers for existing panelboards shall be manufactured by the existing panel manufacturer. Breakers shall have the same or higher fault current rating. Provide all required existing panelboard manufacturer supplied mounting hardware and filler plates.
   1. Provide filler plates for any existing openings in any existing panelboards. All open breaker or buss spaces shall be closed with a filler plate.
   2. Provide keys for handle locks on all existing panels that are not located insode and electrical or mechanical room. See drawings for identified panels.

H. Surge Suppression: Where shown on the drawings, panels shall be provided with a surge suppressor mounted external to the panelboard. Integral or internally mounted TVSS devices will not be accepted.
   1. In all cases, all required UL Listings shall be maintained for both the panelboards and the surge suppressors.
   2. In all cases, all warranties shall be maintained for both the panelboards and the surge suppressors.
   3. In all cases, all National Electrical Code requirements shall be maintained for both the panelboards and the surge suppressors.
   4. In all cases, all surge suppressors shall meet the requirements of Specification Section 16680. Entire panel submittal will be subject to rejection based upon this requirement.
   5. In all cases above, the panelboards shall meet the requirements of this specification section and shall be furnished by an approved panelboard manufacturer listed in this section.
   6. In all cases above, the panelboards and the surge suppression devices shall be submitted for approval as a package at the same time. One will not be approved without the other.
   7. Provide a three pole, 30 amp circuit breaker to serve the surge suppressor. Utilize #10 awg conductors for phase, neutral and ground.

8. See Specification Section 16680 for more requirements.

PART 3 - EXECUTION

3.1 INSPECTION

A. Installer must examine areas and conditions under which panelboards and enclosures are to be installed, and notify Contractor in writing of conditions detrimental to proper completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 INSTALLATION OF PANELBOARDS

A. General: Install panelboards and enclosures as indicated, in accordance with manufacturer's written instructions, applicable requirements of NEC standards and NECA's "Standard of Installation", and in compliance with recognized industry practices, to ensure that products comply with requirements.
B. Coordinate installation of panelboards and enclosures with cable and raceway installation work.
C. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Stds 486A and B.
D. Anchor enclosures firmly and securely to walls and structural surfaces, ensuring that they are permanently and mechanically secure and plumb.
E. Provide properly wired electrical connections within enclosures.
F. Provide typewritten circuit directory card in panel door upon completion of installation work.
G. Where panels are mounted flush in the wall, a minimum of three (3) spare 3/4" conduit shall be installed stubbed out a minimum of eight (8) inches above ceiling.

3.3 GROUNDING

A. Provide equipment grounding connections for panelboards as indicated. Tighten connections to comply with tightening torques specified in UL Stds 486A and B to assure permanent and effective grounds.

3.4 FIELD QUALITY CONTROL

A. Prior to energization of circuitry, check all accessible connections to manufacturer's tightening torque specifications.
B. Prior to energization of panelboards, check with ground resistance tester phase-to-phase and phase-to-ground insulation resistance levels to ensure requirements are fulfilled.
C. Prior to energization, check panelboards for electrical continuity of circuits for short-circuits.
D. Subsequent to wire and cable hook-ups, energize panelboards and demonstrate functioning in accordance with requirements. Where necessary, correct malfunctioning units, and then retest to demonstrate compliance.
E. Prior to final acceptance completely fill out the circuit directories accurately depicting the equipment connected to each circuit. Circuit directories shall be typewritten.

END OF SECTION

SECTION 16510 - INTERIOR BUILDING LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division-16 Basic Electrical Materials and Methods section apply to work specified in this section.

1.2 DESCRIPTION OF WORK
- A. Extent of interior lighting fixture, also known as luminaire, work is indicated by drawings and schedules.
- B. Types of interior lighting fixtures in this section include the following:
  1. Fluorescent
- C. Applications of interior lighting fixtures required for project including the following:
  1. General lighting
  2. Emergency lighting

1.3 QUALITY ASSURANCE
- A. Manufacturers: Firms regularly engaged in manufacture of interior lighting fixtures of types and ratings required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer: Qualified with at least 3 years of successful installation experience on projects with interior lighting fixture work similar to that required for project.
- C. NEC Compliance: Comply with NEC as applicable to installation and construction of interior building lighting fixtures.
- D. NEMA Compliance: Comply with applicable requirements of NEMA Std Pub Nos. LE 1 and LE 2 pertaining to lighting equipment.
- E. ANSI/IES Compliance: Comply with ANSI 132.1 pertaining to interior lighting fixtures.
- F. ANSI/UL Compliance: Comply with ANSI/UL standards pertaining to interior lighting fixtures for hazardous locations.
- G. UL Compliance: Provide interior lighting fixtures which have been UL-listed and labeled.
- H. CBM Labels: Provide fluorescent-lamp ballasts which comply with Certified Ballast Manufacturers Association standards and carry the CBM label.

1.4 SUBMITTALS
- A. Product Data: Submit manufacturer's data on interior building lighting fixtures, lamps and ballasts.
- B. Shop Drawings: Submit fixture shop drawings in booklet form with separate sheet for each fixture, assembled in luminaire "type" alphabetical order, with proposed fixture and accessories clearly indicated on each sheet. If requested by the Engineer, samples shall be submitted to determine compliance and equivalence, at no cost to the owner or architect/engineer. If requested by the Engineer, point-by-point footcandle calculations shall be submitted to determine compliance and equivalence. Criteria for calculations (max/min, reflectances, dirt depreciation, etc., shall be obtained from the Engineer.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS
- A. Manufacturers/Catalog Numbers: Subject to compliance with requirements, provide fixtures manufactured by manufacturers as indicated on the fixture schedule. Catalog numbers given on the fixture schedule are intended to provide the general description of the required fixture and its quality. Additional accessories, mounting hardware, options, etc., not specifically described by the catalog number but required for a properly operating and installed fixture or as described by additional notation on the drawings or in the specifications, shall be provided.
  1. Substitutions shall be prior approved by an official addendum. Complete shop drawings shall be submitted for review for consideration of substitutions.

2.2 INTERIOR LIGHTING FIXTURES
- A. General: Provide lighting fixtures, of sizes, types, and ratings indicated; complete with, but not necessarily limited to, housings, lamps, lamp holders, reflectors, ballasts, starters and wiring.
- B. Fluorescent-Lamp Ballasts: Provide energy saving high frequency electronic fluorescent-lamp ballasts, capable of operating 32 watt, octic, T-8 lamp types; with high power factor, programmed rapid-start, and low-noise features; Type 1; Class P; sound-rated A, and with internal thermal protection. All flourescent fixture ballasts shall be of the same manufacturer and type. Ballasts shall also meet the following requirements:
  1. Operate lamps at 20 KHZ or higher with no detectable flicker.

2. Ballast manufacturer shall have been producing electronic ballasts in the U.S. for more than five years with a low failure rate.
3. Ballasts shall be approved and listed by UL.
4. Ballasts shall comply with all applicable state and federal efficiency standards.
5. Ballasts shall comply with FCC and NEMA limits governing electromagnetic and radio frequency interference and shall not interfere with operation of other normal electrical equipment.
6. Ballasts shall meet all applicable ANSI and IEEE standards regarding harmonic distortion and surge protection, but shall have total harmonic distortion not exceeding 20%.
7. Ballasts shall not be affected by lamp failure and shall yield normal published expected lamp life.
8. Lamp current crest factor shall not exceed 1.7.
9. Ballasts shall operate at an input frequency of 60 HZ and an input voltage of that indicated on the drawings for the fixture voltage.
10. Ballasts shall have a power factor above 0.95.
11. Ballasts shall be manufactured by Phillips, or Osram/Sylvania or approved equal.

C. Fusing all fluorescent ballasts shall be fused. Fuses may be deleted if the ballast is supplied with automatically resetting thermal overloads internal to the ballast.
D. Lamps: Provide lamps of the wattage and types specified on the drawings. Coordinate lamp type with ballast for a complete operational, energy saving lighting system which will operate for the expected lamp and ballast life.
   1. Fluorescent lamps shall be rapid start, T-8, medium bi-pin, 32 watt, 4200°K, 85 CRI, 2,950 initial lumens, 20,000 average rated hours. Lamps shall meet current TCLP requirements. Sylvannia F032T8/841/XP/ECO3 or equal by GE, Sylvannia, or Phillips.
   2. Ballasts shall be programmed rapid start, minimum 0.71 ballast factor, less than 10% THD, greater than 0.98 PF, Sylvannia Quicktronic Prostart Model QTP-X32T8/UNV/PSX-TC or equal by GE or Advance.
E. Ballast/Lamp Assembly Warranty: Provide a minimum five year ballast guarantee, along with a five year lamp guarantee. This warranty shall be provided as an assembly with the ballast and lamp manufacturer agreeing to provide the required warranty with the associated ballast or lamp.

PART 3 - EXECUTION

3.1 INSTALLATION OF INTERIOR LIGHTING FIXTURES
A. Install interior lighting fixtures at locations and heights as indicated, in accordance with fixture manufacturer's written instructions, applicable requirements of NEC, NECA's "Standard of Installation", NEMA standards, and with recognized industry practices to ensure that lighting fixtures fulfill requirements.
B. Coordinate with other electrical work as appropriate to properly interface installation of interior lighting fixtures with other work.
C. Fasten fixtures securely to building structural support; and ensure that pendant fixtures are plumb and level. Provide all required mounting hardware and steel channel to supplement structural support where necessary. Fixtures shall not be supported from ductwork, piping, conduits, ceiling grid or any other non-structural building member.
D. Coordinate fixture installation with mechanical duct work, diffusers, return grilles, communication systems devices, etc., to avoid any interferences.

3.2 ADJUST AND CLEAN
A. Clean interior lighting fixtures of dirt and debris upon completion of installation
B. Protect installed fixtures from damage during remainder of construction period.

3.3 FIELD QUALITY CONTROL
A. Upon completion of installation of interior lighting fixtures, and after building circuitry has been energized, apply electrical energy to demonstrate capability and compliance with requirements. where possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units, and proceed with retesting.
B. At the time of Substantial Completion, replace lamps in interior lighting fixtures which are observed to be noticeably dimmed after Contractor's use and testing, as judged by Architect/Engineer.
C. Refer to Division-1 sections for the replacement/restoration of lamps in interior lighting fixtures, where used for temporary lighting prior to time of Substantial Completion.

3.4 GROUNDING
A. Provide tight equipment grounding connections for each interior lighting fixture installation.

END OF SECTION

SECTION 16680 SURGE PROTECTION DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions Specification Sections, apply to this Section.

1.2 SUMMARY
- A. This Section includes transient voltage surge suppressors for low-voltage (600Volts and below) power equipment
- B. Related Sections include the following:
  1. Division 16 Section "Wiring Devices" transient voltage surge suppressors.
  2. Division 16 Section "Panelboards"
  3. Division 16 Section "Switchboards"

1.3 SUBMITTALS
- A. Must have ten day prior approval to submit on project.
- B. Request for submittals must be in writing and attached with independent documentation of the following items.
- C. Drawings: Electrical and mechanical drawings shall be provided by the manufacturer which show unit dimensions, weights, mounting provisions, connection notes, wire size and wiring diagram.
  1. SPD's with dimensions that exceed the available space to mount the device within the required maximum lead lengths will be rejected and not accepted. Verify maximum lead lengths can be met prior to bid.
- D. Equipment Manual: The manufacturer shall furnish an installation manual with installation notes, start-up and operating instructions for the specified system. Installation instructions shall clearly state whether the system requires an external overcurrent device to maintain the system's UL 1449 listing. SPD requiring external overcurrent devices are not acceptable.
- E. Verification that all SPD are UL 1449 3rd Edition listed and rated with a 20kA (In) nominal discharge rating for compliance to UL96A Lightning Protection Master Label and NFPA 780. Also provide UL 1449 3rd Edition VPR showing the following maximum VPR (clamping voltage) as follows:
  1. 120Vsystem 600V (L-N)
  2. 277Vsystem 1200V (L-N)
- F. SPD manufacturer shall provide UL 3rd Edition documentation as part of submittal.
- G. Manufacturer's Warranty Statement, showing a 10 year replacment warranty for modules or unit are damaged by transient voltages

1.4 STANDARDS
- A. Underwriters Laboratories 1449 - (UL 1449 3rd edition safety standard for surge protection devices – 2009)
- B. NEC article 285. National Electrical Code 2008 SPD shall be labeled with a minimum 200kAIC rating.
- C. NFPA 780 Standard for the installation of lightning protection systems
- D. UL96A - Lightning Protection System Master Label
- E. IEEE (Institute of Electrical and Electronic Engineering Inc.) C62.41.1 and C62.41.2 – 2002, IEEE C62.45 – 2002, IEEE C62.33 & C62.35
- F. All manufacturers must comply with above listed standards and any additions current revisions of industry standards. All products that do not comply with current industry standards will not be accepted.

1.5 QUALITY ASSURANCE
- A. Source Limitations: Obtain suppression devices and accessories through one source from a single manufacturer.

1.6 PROJECT CONDITIONS
- A. Placing into Service: Do not energize or connect service entrance equipment, panel boards, control terminals, or data terminals to their sources until the surge protective devices are installed and connected.
- B. Service Conditions: Rate surge protective devices for continuous operation under the following conditions, unless otherwise indicated:
  1. Maximum Continuous Operating Voltage (MCOV): Not less than 115 percent
  2. Operating Temperature: 30 to 120 deg F (0 to 50 deg C).
  3. Humidity: 0 to 85 percent, non-condensing.
  4. Altitude: Less than 20,000 feet (6000 m) above sea level.

1.7 COORDINATION
A. Coordinate location of field-mounted surge suppressors to allow adequate clearances for maintenance.
B. Coordinate surge protective devices with Division 16 Section "Panelboards" and "Switchboards".

1.8 WARRANTY
A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
B. Manufacturer shall provide a product warranty for a period of not less than ten (10) years from date of installation. Warranty shall cover unlimited replacement of SPD modules during the warranty period. Those firms responding to this specification shall provide proof that they have been regularly engaged in the design, manufacturing and testing of SPD for not less than five (5) years.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS
A. PQ Protection
B. APT
C. Surge Suppression, Inc.

2.2 SERVICE ENTRANCE SUPPRESSORS (Type SPD1)

Panel Amperage	**≥3,000Amps**	**2500-1600Amps**	**1200-400Amps**
Service Entrance	400kA/Modular	300kA/modular	200kA/modular

A. Provide service entrance rated, UL Type 1 SPD's as shown and indicated on contract drawings.
B. Minimum surge current ratings per phase shown above, three phase, wye systems per phase rating shall equal L-N and L-G modes added together. No other methods are acceptable for per phase surge current rating calculations.
C. SPD's shall be a multi-stage parallel connected device.
D. SPD's UL 1449 3rd Edition VPR (clamping voltage) shall be a maximum rating of:
   1. 120Vsystem 600V (L-N)
   2. 277Vsystem 1200V (L-N)
E. SPD's shall mount external to the panel; internally mounted SPD's are not acceptable.
F. SPD voltages shall be verified by location on drawings, one-line diagrams and equipment schedules.
G. SPD shall be modular design with field replaceable modules per phase and per mode.
H. SPD shall have redundant status indicators on the front of the enclosure and shall monitor and indicate whether suppression capabilities have been compromised.
I. SPD shall contain protective components that utilize multiple thermally protected metal oxide varistors (MOV) per mode.
J. SPD's relying upon external and/or supplementary installed safety overcurrent protection do not meet the intent of this specification.
K. SPD's that are limited to being connected to breaker whether or not an integral disconnect switch is supplied do not meet the intent of this specification.
L. SPD's shall have an UL "In" rating (nominal discharge) of 20kA.
M. SPD shall have dry contacts for remote monitoring via the Campus security system (Ademco panels). Coordinate the required contact type with the existing security panels.
N. Service Entrance SPD's shall have audible alarms and surge counters.
O. SPD's shall have a metal, NEMA 4 rated enclosure.
P. SPD shall be designed and equipped with integral disconnecting means.
Q. Protection modes: The SPD shall provide Line to Neutral (L-N) (Wye), Line to Ground (L-G) (Wye or Delta), Line to Line (L-L) (Delta) and Neutral to Ground (N-G) (Wye) protection.

2.3 DISTRIBUTION, BRANCH PANEL AND/OR AUXILIARY PANELS (TYpe SPD2)

Panel Amperage	**1200-800A**	**600A**	**400-100A**
Distribution	200kA	200kA	200kA
Branch Panels		100kA	100kA

A. Provide UL Type 2 SPD's as shown and indicated on contract drawings. Any panel indicated to be 600 amp or larger, and any panel that is the service disconnect panel for the building shall be considered a "Distribution" type.
B. SPD's minimum surge current ratings per phase shown above, three phase, wye systems per phase rating shall equal L-N and L-G modes added together. No other methods are acceptable for per phase surge current rating calculations.
C. SPD's shall be a multi-stage parallel connected device.
D. SPD's shall mount external to the panel; internally mounted SPD's are not acceptable.
E. SPD voltages shall be verified by location on drawings, one-line diagrams and equipment schedules.
F. SPD shall be a compact, non-modular design
G. SPD shall have per phase status indicators on the front of the enclosure and shall monitor and indicate whether suppression capabilities have been compromised.
H. SPD shall contain protective components that utilize multiple thermally protected metal oxide varistors (MOV) per mode.
I. SPD's relying upon external and/or supplementary installed safety overcurrent protection do not meet the intent of this specification.
J. SPD's shall have an UL "In" rating (nominal discharge) of 20kA.
K. SPD shall have dry contacts for remote monitoring capabilities.
L. SPD's shall have a metal, NEMA 4 rated enclosure
M. Protection modes: The SPD shall provide Line to Neutral (L-N) (Wye), Line to Ground (L-G) (Wye or Delta), Line to Line (L-L) (Delta) and Neutral to Ground (N-G) (Wye) protection.

PART 3 - EXECUTION

3.1 INSTALLATION OF SURGE PROTECTIVE DEVICES
A. Review all installation information in manufacturer's installation manual prior to installing SPD's.
B. Verify all voltages before connecting to avoid injury and damage to equipment.
C. The SPD's shall be installed external to switchboard, distribution and panelboard.
D. Internally mounted SPD's will not be accepted.
E. The service entrance/switchboard/switchgear SPD's shall be installed with the shortest lead length possible and shall avoid any unnecessary or sharp bends. SPD's shall be connected to breakers with a 30 amp, 3 pole breaker for connection means.
F. The distribution, panelboard and auxiliary SPD's shall be installed with the shortest lead length possible from the panel it is protecting and shall avoid any unnecessary or sharp bends. SPD's shall be connected to breakers with a 30 amp, 3 pole breaker for connection means.
G. Ground resistance shall be 5 Ohms or less.
H. Refer to manufacturer's installation manual for further installation details.

3.2 FIELD QUALITY CONTROL
A INSTALLATION
1. After installing surge protective devices, but before electrical circuitry has been energized, test for compliance with manufacturers' installation instruction requirements and recommendations.
B MANUFACTURERS FIELD SERVICE
1. Engage a factory authorized service representative to inspect equipment installation. Report results in writing
2. Verify that electrical wiring installation complies with manufacturer's installation requirements.

END OF SECTION

SECTION 16721 - FIRE ALARM AND SMOKE DETECTION SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES
- A. An addressable fire alarm and smoke detection and supervisory system.

1.2 REFERENCES.(FIRE ALARM SHALL COMPLY WITH THE FOLLOWING)
- A. NFPA 70 - National Electrical Code, 2011
- B. NFPA 72 - National Fire Alarm Code, 2013.
- C. 5th Edition of The Florida Fire Prevention Code (FFPC): (This Code also includes the Florida versions of NFPA 1 And NFPA 101.) (Effective December 31, 2014)
- D. 5th Edition of the Florida Building Code – 2014.

1.3 REGULATORY REQUIREMENTS
- A. System: UL listed.
- B. Conform to requirements of NFPA 101 and the Local Fire Marshall.

1.4 DESCRIPTION OF SYSTEM
- A. Expand the existing fire alarm system to provide for new duct mounted smoke detectors, fan shutdown, and other required devices and circuits.

1.5 QUALIFICATIONS
- A. Manufacturer: Company specializing in smoke detection and fire alarm systems with five (5) years documented experience.
- B. Installer: Company specializing in smoke detection and fire alarm systems with five (5) years documented experience with projects of equivalent scope of work and size and certified by the Florida State Licensing Board as fire alarm installing contractor. The actual installer shall be liscensed to install fire alarm systems and shall be certified by the system manufacturer to install the system. Proof of certification and liscensure shall be provided upon request.

1.6 SUBMITTALS
- A. Submit six (6) copies shop drawings and product data.
- B. Provide complete point to point wiring diagrams, data sheets, and equipment ratings, layout, dimensions, and finishes. Indicate the location of surge protection devices.
- C. Submit manufacturer's installation instructions.
- D. Submit manufacturer's certificate that the system meets or exceeds specified requirements - certification per NFPA 72.
- E. Submit copy of Contractor's license before work begins.
- F. Submit battery calculations indicating the required battery, including the specified spare capacity.
- G. Submit voltage drop calculations.
- H. Provide training for four (4) people on the operation, maintenance, and repair of the system at the Contractor's expense. Training shall be certified by the manufacturer and be at different times for each person. Include transportation, room and board where needed.

1.7 PROJECT RECORD DRAWINGS
- A. Contractor shall provide five (5) sets of as-built drawings to the Owner upon completion of project.
- B. As-builts shall include the location of end-of-line devices, surge protection devices and exact conduit and wire routing. Numbers and types or conductors shall be indicated for each circuit.

1.8 OPERATION AND MAINTENANCE DATA
- A. Provide seven (7) copies of operation and maintenance data prior at the completion of construction for all point devices, CPUs, and all other equipment.
- B. Include operating instructions, and maintenance and repair procedures.
- C. Provide manufacturer representative's letter stating that the system is operational.
- D. Maintain system for a minimum of one (1) year, after complete acceptance by the Owner, in accordance with NFPA 72.
- E. Provide, at the end of the first year after construction completion, a yearly certification as outlined by the State Fire Marshal's Rule 4A-48.

1.9 DELIVERY, STORAGE, AND HANDLING
- A. Products shall be delivered to job site in manufacturers original shipping packages.
  1. Provide storage and protection of products, as needed.

1.10 SPECIAL REQUIREMENTS

A. The Fire Alarm System herein specified shall be furnished by a manufacturer of Fire Alarm Systems who has been conducting business in the Tampa Bay area for at least five (5) years. A complete stock of parts for the systems furnished shall be in inventory at the facilities of the supplier. The equipment manufacturer shall have service facilities within a fifty (50) mile radius with parts in stock and trained service personnel and shall respond to a service call within twenty-four (24) hours after request during the warranty period (four (4) hours for an emergency request).
B. Installation to be performed only by Manufacturer's authorized installer.
C. Pre and Post Project Testing: The Contractor may choose to perform a complete system test prior to starting construction to determine the status of the existing fire alarm system campus-wide. Any and all system discrepancies shall be documented in a complete test report submitted to the owner and architect prior to the beginning of any work on the project. After the project is complete the system shall be completely tested. Any problems with the system, including any existing devices that were to remain, shall be corrected at the contractor's expense unless the problem was specifically identified prior to the start of construction.
D. Existing fire alarm system shall be operational when the building or campus is occupied. All costs for labor and materials necessary to accomplish any required phasing shall be included. Any downtime required for the construction shall be coordinated with the Owner and approved by the Owner prior to bidding. Costs for any necessary overtime and use of the Owner's custodial staff after hours shall be included in the bid.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. ADT Unimode 10 is the existing fire alarm control panel to remain. New wiring and devices shall be compatible with this existing panel.
NOTE : Approval of manufacturer's equipment does not any way relieve the Contractor from meeting the performance criteria as outlined in the Plans and Specifications.

2.2 FIRE ALARM CONTROL PANEL (FACP)

A. Existing panel shall remain and be modified as required to add the new devices and wiring. This shall include all required system cards, power supplies, batteries, cabinet and other accessories or devices as needed to meet code and these specifications.
1. Provide a minimum of 8 amps of power supply/battery charging current.
2. Expansion Capability & Spare Capacity: Provide the capability to add a minimum of two future indicating appliance circuits in the control panel.

2.3 INITIATION DEVICES AND ACCESSORIES – ADDRESSABLE (AS APPLIES)

A. Smoke Detectors: NFPA 72; photoelectric type with plug-in base, supervised visual indication of detector actuation, suitable for mounting on four inch (4") outlet box.
1. Detectors shall be listed to U.L. Standard 268 and shall be documented compatible with the control equipment to which it is connected. Detectors shall be listed for this purpose by Underwriters Laboratories, Inc. The detectors shall obtain their operating power from the fire alarm panel supervised detection loop. The operating voltage shall be 24 VDC (nominal). Removal of the detector head shall interrupt the supervisory circuit of the fire alarm detection loop and cause a trouble signal to be generated at the control panel. Detectors shall be the addressable type for use on an addressable type system.
2. Each detector shall have a flashing status indicating LED for visual supervision. When the detector is actuated, the flashing LED will latch on steady and at full brilliance. The detector may be reset by actuating the control panel reset switch.
3. To minimize nuisance alarms, voltage, EMI and RF transient suppression techniques shall be employed as-well-as a smoke verification circuit and an insect screen. The detector design shall provide full solid-state construction and compatibility with other normally open fire alarm detection loop devices (heat detectors, pull stations, etc.). The detector head shall be easily disassembled to facilitate cleaning.
4. Smoke Detector Sensitivity Adjust: Means shall be provided for adjusting the sensitivity of any or all analog intelligent smoke detectors in the system from the System keypad or from the keyboard of the video terminal. Sensitivity range shall be within the allowed UL window. The detector shall employ automatic environmental compensation.
5. Alarm Verification: Each of the Intelligent/Addressable Smoke Detectors in the system may be independently selected and enabled to be an alarm verified detector. The Alarm Verification Function shall be programmable from 5 to 50 seconds and each detector shall be able to be selected for verification during the field programming of the system, or anytime after system turn-on. The Alarm Verification shall not require any additional hardware to be added to the Fire Alarm Control Panel. The FACP shall keep a count of the number of times that each detector has entered the verification cycle. These counters may be displayed and reset by the proper operator commands.

B. Duct Mounted Smoke Detectors: Duct mounted smoke detectors shall be of the solid state photoelectric type and shall operate on the light scattering photodiode principle. The detectors shall be the same as the smoke detectors described in Section 2.03, C., above. Detectors shall be 4 wire operation, addressable type for use on an addressable type system. The detectors shall be mounted in a duct housing with an integral red LED which shall pulse continuously to indicate power on and glow continuously to indicate alarm or sensor trouble condition. The detectors shall be designed to ignore invisible airborne particles or smoke densities that are below the factory set alarm point. No radioactive materials shall be used. Detectors shall be provided with the capability of performing automatic fan shutdown either directly from the detector or via the main control panel.
   1. Provide a remote alarm indicator with a test switch for duct mounted smoke detector.
   2. Provide a sampling tube sized for the required duct width and rated for the air velocity present in the duct.
   3. Provide duct mounted smoke detectors for all air handling systems equal to or greater than 2,000 cfm. Provide detectors on both the supply and the return.

2.4 INDICATING APPLIANCES AND ACCESSORIES
A. Programmable Electronic Sounders:
   1. Electronic sounders shall operate on 24 VDC nominal.
   2. Electronic Sounders shall be field programmable without the use of special tools, to provide the State Fire Marshall required tone with an output sound level of at least 115 dBA measured at 10 feet from the device not to exceed 120 dbA. Alarm shall sound in march time or the Fire Marshal required tone and cadence. Sounders in restrooms shall be 30 dBA maximum.
   3. Shall be flush semi-flush mounted.
   4. Sounders shall be moisture repellent, fire retardant designed for smooth frequency response with minimal distortion. Sounders shall be U.L. listed and approved for use as a fire alarm indicating appliance.
   5. Seimens current design or equal with required accessories. Must be compatible with the existing system
B. Strobe Lights:
   1. Visual Flashing Lamps (Xenon Strobe): Visual indicating appliances shall be comprised of xenon flashtube and be entirely solid state. These devices shall be UL listed for use as a fire alarm indicating appliance and be capable of either ceiling or wall mounting. The lexan lens shall be pyramidal in shape to allow better visibility.
   2. Shall operate on 24 VDC nominal.
   3. Shall meet the requirements of the ADA as defined in UL standard 1971 and shall meet the following criteria:
      a. The maximum pulse duration shall be 2/10ths of one second.
      b. Unless otherwise specified on the drawings or required for ADA compliance, the intensity shall be a minimum of 100 candela.
      c. The flash rate shall be a minimum of 1 Hz and a maximum of 3 Hz.
      d. The appliance shall be placed 80 in (2,030 mm) above the highest floor level within the space, or 6 in (152 mm) below the ceiling, whichever is the lower.
   4. Seimens current design or equal with required accessories. Must be compatible with the existing system
C. Audible/Visual Combination Devices:
   1. Audio/Visual Alarm Indicating Appliance: Audio/Visual units shall provide a common enclosure for the fire alarm audible and visual alarm devices. The housing shall be designed to accommodate either horns, bells, chimes, or speakers. The unit shall be complete with a tamper resistant, pyramidal shaped lexan lens with "Fire" lettering visible from a 180 degree field of view. The front panel or bezel which is constructed of cast metal or LEXAN maybe inverted so that the lens is below the audible device. The lamp assembly shall incorporate a built-in reflector for more efficient light propagation and a special shock-mounting arrangement to resist lamp failure due o vibration. Unit shall be complete with all mounting hardware including backbox. Audio/Visual unit shall be UL Listed as a fire alarm indicating appliance.
   2. Shall meet the applicable requirements of Section A listed above for audibility.
   3. Shall meet the requirements of Section B listed above for visibility.
   4. Seimens current design or equal with required accessories. Must be compatible with the existing system

2.5 MISCELLANEOUS DEVICES AND ACCESSORIES
A. Relays and Control Modules for auxiliary control: Provide auxiliary control relays or control modules for air handler fan shutdown and other required control functions indicated on the drawings or otherwise specified. All auxiliary control circuits shall be indicated on the annunciator shall be addressable using a monitor module so the device can be identified quickly and accurately.
B. Monitor Module (Individual Addressable Module)

1. Addressable Monitor modules shall be provided to connect one supervised circuit of a conventional alarm or trouble initiating device (any N.O. dry contact device), such as tamper switches and water flow switches, etc., to the Fire Alarm Control Panel.
2. The Monitor Module shall mount in a 4-inch square, 2-1/8" deep electrical box.
3. The conventional alarm initiating device may be wired for Style D or Style B operation. The Monitor module shall provide address-setting means using decimal switches and shall also store an internal identifying code that the Fire Alarm Control Panel shall use to identify the type of device. Modules that use binary jumpers or dip-switches are subject to installation errors are not acceptable. An LED shall be provided that shall flash under normal conditions, indicating that the Monitor module is operational and in regular communication with the control panel.
4. For difficult to reach areas, the Monitor Module shall be available in a miniature package and shall be no larger than 2-3/4" x 1-1/4" x 1/2". This version need not include Style D or an LED.

C Provide devices and circuits for all tamper switches and flow switches in the fire protection systems (sprinklers).

2.6 BATTERY BACK-UP

A. The system shall be battery back-up for 24 hours plus five (5) minutes of alarm capabilities after a 24 hour standby period (per NFPA 72) with all system indicating appliances operating, including strobes, plus 30% spare capacity. Batteries shall be completely sealed, rechargeable type and maintenance free. Provide a separate battery cabinet if required to house the necessary batteries. Expand the existing system as necessary.

2.7 LIGHTNING PROTECTION

A. Provide surge suppression devices on each new initiating device circuit and each new indicating appliance circuit.
B. All lightning protection shall be manufactured and listed for use with the fire alarm system by EDCO, DiTEk or approved equal. Devices shall be terminal strip mounted and shall be mounted in a separate cabinet if required to meet UL or NFPA requirements.
C. Lightning protection devices shall be UL listed. The clamping voltage shall be coordinated with the system voltage to avoid nuisance clamping. Devices found to clamp to quickly shall be replaced.

2.8 DIGITAL ALARM COMMUNICATOR TRANSMITTER (DACT)

A. Provide digital alarm communicator for remote monitoring. The Owner will provide the phone lines and monitoring service.

2.9 FIRE ALARM CABLE

A. All fire alarm conductors shall meet the requirements of the local fire marshall and the National Electrical Code.

PART 3 - SEQUENCE OF OPERATION

3.1 ENTIRE BUILDING

A. Program the fire alarm sequence as required to meet the Florida Building Code, the Florida Fire Prevention Code – Florida Specific Edition of NFPA-101, and NFPA-72.

PART 4- PROGRAMMING

4.1 The system shall be fully programmed and completely operational prior to acceptance. The FACP and CPU shall have the capability to be fully programmable by Owner's personnel. Provide all necessary software access to the owner for re-programming by the owner.

4.2 The Manufacturer shall provide the necessary documentation and training to allow the Owner's personnel to maintain and change software.

4.3 Program data shall be stored in non-volatile memory with battery back-up. Program data shall not be lost due to temporary outages, surges, dips, etc.

PART 5 - EXECUTION

5.1 INSTALLATION OF FIRE ALARM AND DETECTION SYSTEMS

A. Install fire alarm and detection systems as indicated, in accordance with equipment manufacturer's written instructions and complying with applicable portions of NEC and NECAs "Standard of Installation" and NFPA-72.
B. Wiring Systems and Materials
   1. Wiring shall be in accordance with requirements of the National Electrical Code and NFPA Regulation 72. The fire alarm system, including components, conduit, boxes and wiring shall be completely installed

and wiring and conduit shall be properly tagged and color coded. The Electrical Contractor shall make final connections as shown and required by the equipment manufacturer's wiring instructions.

2. Wiring shall be color coded as follows:
   Existing Systems (match existing color codes)
   a. Manual Stations, Smoke & Heat Detectors — Violet
   b. Horns — Yellow & Blue
   c. Flashing Lights — Orange
   d. Door Holders — White
   e. Air Handler Shutdown Relays — Purple
   f. Smoke Detector Supervisory — Brown
   g. Control Panel power — Black & White

C. All wire shall be terminated with crimp type open-end spade lugs using tool approved by plug manufacturer. Wire terminating at the control panel or terminal cabinets shall be identified as to circuit and use.

D. Wiring run to terminal cabinets shall terminate on barrier-type terminal strips. Provide all new terminal strips.

E. All wiring to be installed in conduit with continuous ground. Existing system conduit may be used only where possible with the phasing of the project, and where it is in acceptable condition.

F. All junction box covers shall be painted red. All lengths of conduits shall have at least one red stripe.

G. AHU shutdown relays and equipment control relays shall be mounted within three (3) feet of controlled device. AHU shutdown relays shall be wired on a separate circuit.

H. Visual flashing lamps and speakers shall be wired on alternate circuits to provide coverage in the event of the failure of one circuit. Provide the required number of circuits for the indicated number of alarm indicating devices.

I. Air handler (or RTU) shutdown shall be controlled from the main Fire Alarm Control Panel. A disconnect switch shall be provided as part of the Fire Alarm Control Panel to allow testing of the system without disruption of air conditioning service or to operate air handlers when system cannot be quickly restored to normal. When the disconnect switch is in the disconnect position, a disarrangement trouble signal shall continue to sound at the panel until the switch is restored to normal. Each panel shall incorporate required modules for air handler shutdown whether or not air handlers exist so that no modifications or additions shall be required for shutdown of air handlers installed in the future. Label switch “FAN DISCONNECT”.

5.2 QUALITY ASSURANCE

A. NEC Compliance comply with NEC as applicable to construction and installation of fire alarm and detection system components and accessories.

B. UL Compliance and Labeling - Provide fire alarm and detection system components which are UL listed and labeled. Installation is to be by a UL listed installer.

C. Misc. compliance - The fire alarm system is to be installed in accordance with the equipment manufacturer's written instructions and comply with all applicable portions of the NECAs "Standard Installation" and all local codes and ordinances.

5.3 FIELD QUALITY CONTROL

A. Inspect relays and signals for malfunctioning, and where necessary adjust units for proper operation to fulfill project requirements. Any fine adjustment shall be performed by specially trained personnel in direct employ of manufacturer of the fire alarm detection system eguipment. The Manufacturer's representative shall perform a quality inspection off the final installation and, in the presence of the Electrical Contractor, Architect/Engineer, and Owner's Representatives, shall perform a complete functional test of the system. A system certification verifying the proper system operation shall be required prior to acceptance by the Owner.

5.4 SYSTEM GUARANTEE

A. All components, parts, and assemblies supplied by the Manufacturer shall be guaranteed against defects in materials and workmanship for a period of twelve (12) months commencing the date of substantial completion. Warranty service shall be provided by a qualified factory trained representative of the equipment manufacturer. Service response time shall be a maximum of four (4) hours before arrival to site.

B. Testing: The Contractor shall perform all electrical and mechanical tests required by the equipment manufacturer's form and National Fire Protection Association - 72. All test and report costs shall be in the contract price. A checkout report shall be prepared by the installation technicians and submitted in triplicate, one (1) copy of which will be registered with the equipment manufacturer. The report shall include, but not be limited to:
   1. A complete list of equipment installed and wired.
   2. Indication that all equipment is properly installed and functions and conforms with these specifications.
   3. Test result of individual initiating devices and indicating appliances.
   4. Serial numbers, locations by zone and model number for each installed detector.
   5. Response time on thermostats and flame detectors (if used).

6. Technician's name, certificate number and date.

C. Documentation: After completion of the tests and adjustments listed above, the Contractor shall submit the following information to the Owner.
   1. A copy of the test report described in this specification and a Certificate of Compliance prepared as per National Fire Protection Association Standard 72, and State Fire Marshal's Rule 4A-48 to be complete at final test.
   2. Affixed to FACP a standard service tag, as described in rule 4A-48 for fire alarm contractors by the Office of the State Fire Marshal.
   3. Final tests and inspection shall be held in presence of the Owners' representatives and to their satisfaction. The Contractor shall supply personnel and required auxiliary equipment for this test without additional cost to the Owner.
   4. Provide a statement of guarantee including date of termination and name and phone number of the person to be called in the event of equipment failure.
   5. One (1) copy of all approved shop drawings, instruction sheets, operating instructions, and spare parts bulletins. Provide two CD's of all updated system programs and settings. Leave one CD inside the FACP and turn one CD in with the O&M manuals.

D. Warranty : All equipment and devices added or modified in the system shall be warranted by the Contractor for a period of one (1) year following the date of final acceptance. The warranty shall include parts, labor, prompt field service, pick-up, and delivery.

END OF SECTION