

# HALLIBURTON

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**NEW BARITE PLANT**

**GARDENDALE, TEXAS**

## **SPECIFICATIONS**

**Issue for Construction**

**December 15, 2011**



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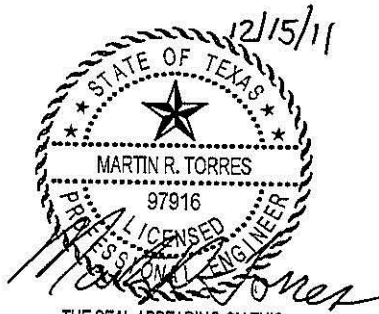
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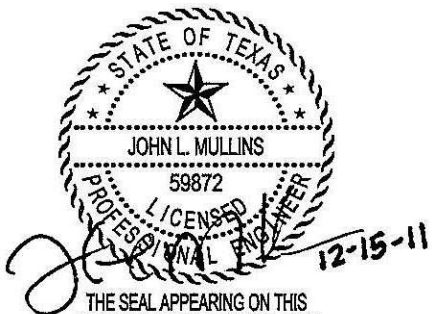


12/15/2011



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ENGINEERING PRACTICE ACT



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END OF SEALS PAGE

**SECTION 01 30 10**  
**SUBMITTALS**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

**1.02 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 responsive action. Submittals may be rejected for not complying with requirements.

**1.03 SUBMITTAL PROCEDURES**

- A. General: Electronic copies of CAD Drawings of the Contract Drawings will be available by Architect for Contractor's use in preparing submittals.
1. It will be the Contractors responsibility to verify the accuracy of the provided CAD file with the built conditions.
  2. The Architect is not responsible for any building components sized and built from the provided CAD files.
  - 3.
- 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 reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. 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. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 14 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
  2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
  3. Resubmittal Review: Allow 14 days for review of each resubmittal.
- D. Identification: Place a permanent label or title block on each submittal for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
  2. Provide a space approximately 6 by 8 inches on label or 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 and Construction Manager.
    - d. Name and address of Contractor.
    - e. Name and address of subcontractor.
    - f. Name and address of supplier.
    - g. Name of manufacturer.
    - h. Submittal number or other unique identifier, including revision identifier.

- 1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 06 10 00.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 06 10 00.01.A).
  - i. Number and title of appropriate Specification Section.
  - j. Drawing number and detail references, as appropriate.
  - k. Location(s) where product is to be installed, as appropriate.
  - l. Other necessary identification.
- E. Deviations: Highlight or otherwise specifically identify deviations from the Contract Documents on submittals.
  1. Provide cut sheet/sheets for original specified product highlighted to show how submitted deviant product is equal or exceeds original.
  2. The contractor shall alert the submittal reviewer of any products or installation methods not consistent with that depicted within the contract documents with the appropriate deviations form. Such information and form related to the deviation will be included with the related submittal and relevant information highlighted for the Architect/Engineer to easily decipher and review for adequacy
- F. Substitutions: The contractor shall alert the submittal reviewer of any specified products requiring substitution with the appropriate substitutions form. Such information and form related to the substitution will be included with the related submittal and relevant information highlighted for the Architect/Engineer to easily decipher and review for adequacy.
- G. Additional Copies: Unless additional copies are required for final submittal, and unless Architect or Construction Manager observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
  1. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect and Construction Manager.
  2. Additional copies submitted for maintenance manuals will not be marked with action taken and will be returned.
- H. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than Contractor.
  1. Transmittal Form: Provide locations on form for the following information:
    - a. Project name.
    - b. Date.
    - c. Destination (To:).
    - d. Source (From:).
    - e. Names of subcontractor, manufacturer, and supplier.
    - f. Category and type of submittal.
    - g. Submittal purpose and description.
    - h. Specification Section number and title.
    - i. Drawing number and detail references, as appropriate.
    - j. Transmittal number, numbered consecutively.
    - k. Submittal and transmittal distribution record.
    - l. Remarks.
    - m. Signature of transmitter.
  2. 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 in the Contract Documents, including minor variations and limitations. Include same label information as related submittal.
- I. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
  1. Note date and content of previous submittal.
  2. Note date and content of revision in label or title block and clearly indicate extent of revision.

3. Highlight or cloud all required revisions for resubmittal.
  4. Resubmit submittals until they are marked "FURNISH AS SUBMITTED" or "EXCEPTIONS AS NOTED" by the reviewer.
- J. Use for Construction: Use only final submittals with mark indicating "FURNISH AS SUBMITTED" or "EXCEPTIONS AS NOTED" by reviewer.

## **PART 2 - PRODUCTS**

### **2.01 ACTION SUBMITTALS**

- A. General: Prepare and submit Action Submittals required by individual Specification Sections. Designate the discipline, log number, and specification section when referencing the submittal on the transmittal cover letter. Use the applicable single discipline/log number as identification of each submittal. Any unacceptable items will be so noted and the entire package returned for correction and resubmittal. Once these items are corrected, the entire Section shall be resubmitted for review of the unacceptable items only. Partial submittals are unacceptable. Intent of this requirement is that all bound sets of data will be identical and will contain only acceptable information.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
  2. Mark each copy of each submittal to show which products and options are applicable.
  3. Include the following information, as applicable:
    - a. Manufacturer's written recommendations.
    - b. Manufacturer's product specifications.
    - c. Manufacturer's installation instructions.
    - d. Standard color charts.
    - e. Manufacturer's catalog cuts.
    - f. Wiring diagrams showing factory-installed wiring.
    - g. Printed performance curves.
    - h. Operational range diagrams.
    - i. Mill reports.
    - j. Standard product operation and maintenance manuals.
    - k. Compliance with specified referenced standards.
    - l. Testing by recognized testing agency.
    - m. Application of testing agency labels and seals.
    - n. Notation of coordination requirements.
  4. Submit Product Data before or concurrent with Samples.
  5. Number of Copies: Submit three copies of Product Data, unless otherwise indicated. Reviewer will return two copies. Mark up and retain one returned copy as a Project Record Document.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    - a. Dimensions.
    - b. Identification of products.
    - c. Fabrication and installation drawings.
    - d. Roughing-in and setting diagrams.
    - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
    - f. Shopwork manufacturing instructions.
    - g. Templates and patterns.
    - h. Schedules.
    - i. Design calculations.

- j. Compliance with specified standards.
  - k. Notation of coordination requirements.
  - l. Notation of dimensions established by field measurement.
  - m. Relationship to adjoining construction clearly indicated.
  - n. Seal and signature of professional engineer, if specified.
  - o. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 40 inches.
  3. Number of Copies: Submit three opaque copies of each submittal, unless copies are required for operation and maintenance manuals. Submit five copies where copies are required for operation and maintenance manuals. Architect will retain two copies; remainder will be returned. Mark up and retain one returned copy as a Project Record Drawing.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
  2. Identification: Attach label on unexposed side of Samples that includes the following:
    - a. Generic description of Sample.
    - b. Product name and name of manufacturer.
    - c. Sample source.
    - d. Number and title of appropriate Specification Section.
  3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
    - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
    - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
  4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
    - a. Number of Samples: Submit one full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
  5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
    - a. Number of Samples: Submit three sets of Samples. Reviewer will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a Project Record Sample.
      - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
      - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.

## 2.02 INFORMATIONAL SUBMITTALS

- A. General: Prepare and submit Informational Submittals required by other Specification Sections.
  - 1. Number of Copies: Submit two copies of each submittal, unless otherwise indicated. Reviewer will not return copies.
  - 2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
- B. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- C. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.
- D. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- E. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- F. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- G. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- H. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- I. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- J. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- K. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- L. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- M. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment.
- N. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams, if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.
- O. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a

product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:

1. Preparation of substrates.
  2. Required substrate tolerances.
  3. Sequence of installation or erection.
  4. Required installation tolerances.
  5. Required adjustments.
  6. Recommendations for cleaning and protection.
- P. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:
1. Name, address, and telephone number of factory-authorized service representative making report.
  2. Statement on condition of substrates and their acceptability for installation of product.
  3. Statement that products at Project site comply with requirements.
  4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
  5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
  6. Statement whether conditions, products, and installation will affect warranty.
  7. Other required items indicated in individual Specification Sections.

### **PART 3 - EXECUTION**

#### **3.01 CONTRACTOR'S REVIEW**

- A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

#### **3.02 ARCHITECT'S ACTION**

- A. General: Architect/Engineer will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Architect, Engineer and Construction Manager will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect, Engineer and Construction Manager will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:
- C. Informational Submittals: Architect/Engineer will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- D. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.
- E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

**END OF SECTION**

**SECTION 01 40 00**  
**QUALITY REQUIREMENTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. References and standards.
- B. Quality assurance submittals.
- C. Control of installation.
- D. Tolerances.
- E. Testing and inspection services.

**1.02 REFERENCE STANDARDS**

- A. ASTM C 1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation; 2007a.
- B. ASTM E 329 - Standard Specification for Agencies Engaged Construction Inspection and/or Testing; 2007a.
- C. ASTM E 543 - Standard Specification for Agencies Performing Nondestructive Testing; 2008.

**1.03 SUBMITTALS**

- A. Testing Agency Qualifications:
  - 1. Prior to start of Work, submit agency name, address, and telephone number, and names of full time registered Engineer and responsible officer.
- B. Design Data: Submit for Multatech Architects Engineers's knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for New Barite Plant's information.
- C. Test Reports: After each test/inspection, promptly submit two copies of report to Multatech Architects Engineers and to Contractor.
  - 1. Include:
    - a. Date issued.
    - b. Project title and number.
    - c. Name of inspector.
    - d. Date and time of sampling or inspection.
    - e. Identification of product and specifications section.
    - f. Location in the Project.
    - g. Type of test/inspection.
    - h. Date of test/inspection.
    - i. Results of test/inspection.
    - j. Conformance with Contract Documents.
    - k. When requested by Multatech Architects Engineers, provide interpretation of results.
  - 2. Test report submittals are for Multatech Architects Engineers's knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for New Barite Plant's information.
- D. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Multatech Architects Engineers, in quantities specified for Product Data.
  - 1. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
  - 2. Certificates may be recent or previous test results on material or product, but must be acceptable to Multatech Architects Engineers.
- E. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the

New Barite Plant's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

- F. Manufacturer's Field Reports: Submit reports for Multatech Architects Engineers's benefit as contract administrator or for New Barite Plant.
  - 1. Submit report in duplicate within 30 days of observation to Multatech Architects Engineers for information.
  - 2. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.
- G. Erection Drawings: Submit drawings for Multatech Architects Engineers's benefit as contract administrator or for New Barite Plant.
  - 1. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.
  - 2. Data indicating inappropriate or unacceptable Work may be subject to action by Multatech Architects Engineers or New Barite Plant.

#### **1.04 REFERENCES AND STANDARDS**

- A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.
- C. Obtain copies of standards where required by product specification sections.
- D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
- E. Should specified reference standards conflict with Contract Documents, request clarification from Multatech Architects Engineers before proceeding.
- F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Multatech Architects Engineers shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

#### **1.05 TESTING AND INSPECTION AGENCIES**

- A. New Barite Plant will employ services of an independent testing agency to perform certain specified testing; payment for cost of services will be derived from allowance contained in Multatech's contract with ROCK Engineering and Testing.
- B. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

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

### **PART 3 EXECUTION**

#### **3.01 CONTROL OF INSTALLATION**

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Multatech Architects Engineers before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Have Work performed by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

- G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

### **3.02 TOLERANCES**

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Multitech Architects Engineers before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

### **3.03 TESTING AND INSPECTION**

- A. Testing Agency Duties:
  - 1. Test samples of mixes submitted by Contractor
  - 2. Provide qualified personnel at site. Cooperate with Multitech Architects Engineers and Contractor in performance of services.
  - 3. Perform specified sampling and testing of products in accordance with specified standards.
  - 4. Ascertain compliance of materials and mixes with requirements of Contract Documents.
  - 5. Promptly notify Multitech Architects Engineers and Contractor of observed irregularities or non-conformance of Work or products.
  - 6. Perform additional tests and inspections required by Multitech Architects Engineers.
  - 7. Attend preconstruction meetings and progress meetings.
  - 8. Submit reports of all tests/inspections specified.
- B. Limits on Testing/Inspection Agency Authority:
  - 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
  - 2. Agency may not approve or accept any portion of the Work.
  - 3. Agency may not assume any duties of Contractor.
  - 4. Agency has no authority to stop the Work.
- C. Contractor Responsibilities:
  - 1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
  - 2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
  - 3. Provide incidental labor and facilities:
    - a. To provide access to Work to be tested/inspected.
    - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
    - c. To facilitate tests/inspections.
    - d. To provide storage and curing of test samples.
  - 4. Notify Multitech Architects Engineers and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
  - 5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
  - 6. Arrange with New Barite Plant's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- D. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Multitech Architects Engineers.
- E. Re-testing required because of non-conformance to specified requirements shall be paid for by Contractor.

### **3.04 DEFECT ASSESSMENT**

- A. Replace Work or portions of the Work not conforming to specified requirements.

- B. If, in the opinion of Owner, it is not practical to remove and replace the Work, Owner will direct an appropriate remedy or adjust payment.

**END OF SECTION**

**SECTION 01 77 00**  
**CLOSEOUT PROCEDURES**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
1. Construction observation procedures.
  2. Warranties.
  3. Final cleaning.

**1.02 SUBSTANTIAL COMPLETION**

- A. Preliminary Procedures: Before requesting construction observation walk through 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. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
  3. 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.
  4. Prepare and submit Project Record Documents, operation and maintenance manuals, damage or settlement surveys, property surveys, and similar final record information.
  5. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
  6. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
  7. Complete startup testing of systems.
  8. Submit test/adjust/balance records.
  9. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
  10. Advise Owner of changeover in heat and other utilities.
  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.
- B. Construction observation: Submit a written request for Construction observation walk through for Substantial Completion. On receipt of request, Architect will either proceed with Construction observation walk through or notify Contractor of unfulfilled requirements. Architect/Engineer will prepare the Certificate of Substantial Completion after Construction observation walk through 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.
1. Reobservation: Request reobservation when the Work identified in previous observations as incomplete is completed or corrected.
  2. Results of completed observation walk through will form the basis of requirements for Final Completion.

**1.03 FINAL COMPLETION**

- A. Preliminary Procedures: Before requesting final observation walk through for determining date of Final Completion, complete the following:
1. Submit certified copy of Architect's Substantial Completion construction observation list of items to be completed or corrected (punch list), endorsed and dated by Architect. The

certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.

2. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
  3. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
- B. Construction observation: Submit a written request for final construction observation walk through for acceptance. On receipt of request, Architect will either proceed with construction observation walk through or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after construction observation or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
1. Reobservation: Request reobservation when the Work identified in previous observations as incomplete is completed or corrected.

#### **1.04 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.
  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.
    - d. Name of Contractor.
    - e. Page number.

#### **1.05 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. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. 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.

### **PART 2 - PRODUCTS**

#### **2.01 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**

### **3.01 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 construction observation 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. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
    - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    - e. Remove snow and ice to provide safe access to building.
    - f. 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.
    - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, manholes, and similar spaces.
    - h. Sweep concrete floors broom clean in unoccupied spaces.
    - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
    - j. 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.
    - k. Remove labels that are not permanent.
    - l. 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.
    - m. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and other foreign substances.
    - n. Replace parts subject to unusual operating conditions.
    - o. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
    - p. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
    - q. Clean ducts, blowers, and coils if units were operated without filters during construction.
    - r. 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.
    - s. Leave Project clean and ready for occupancy.
- C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.

- D. 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.

**END OF SECTION**

**SECTION 01 78 10**  
**PROJECT RECORD DOCUMENTS**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:
  - 1. Record Drawings.
  - 2. Record Specifications.
  - 3. Record Product Data.

**1.02 SUBMITTALS**

- A. Record Drawings: Comply with the following:
  - 1. Number of Copies: Submit one (1) set of marked-up Record Prints.
- B. Record Specifications: Submit one (1) copy of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit one (1) copy of each Product Data submittal.
  - 1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.

**PART 2 - PRODUCTS**

**2.01 RECORD DRAWINGS**

- A. Record Prints: Maintain one set of full size black-line, white prints of the Contract Drawings and Shop Drawings.
  - 1. Preparation: 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 would be difficult to identify or measure and record 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.
  - 2. Content: Types of items requiring marking include, but are not limited to, the following:
    - a. Dimensional changes to Drawings.
    - b. Revisions to details shown on Drawings.
    - c. Depths of foundations below first floor.
    - d. Locations and depths of underground utilities.
    - e. Revisions to routing of piping and conduits.
    - f. Revisions to electrical circuitry.
    - g. Actual equipment locations.
    - h. Duct size and routing.
    - i. Locations of concealed internal utilities.
    - j. Changes made following Architect's written orders.
    - k. Details not on the original Contract Drawings.
    - l. Field records for variable and concealed conditions.
    - m. Record information on the Work that is shown only schematically.
  - 3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
  - 4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.

5. Mark important additional information that was either shown schematically or omitted from original Drawings.
  6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Record CAD Drawings: Immediately before the construction observation walk through for Certificate of Substantial Completion, review marked-up Record Prints with Architect, Engineer and Construction Manager. When authorized, prepare a full set of corrected CAD Drawings of the Contract Drawings, as follows:
1. Format: Same CAD program, version, and operating system as the original Contract Drawings.
  2. Format: DWG, Version, operating in Microsoft Windows operating system.
  3. Incorporate changes and additional information previously marked on Record Prints. Delete, redraw, and add details and notations where applicable.
  4. Refer instances of uncertainty to Architect through Construction Manager for resolution.
  5. Architect will furnish Contractor one set of CAD Drawings of the Contract Drawings for use in recording information.
    - a. Architect/Engineer makes no representations as to the accuracy or completeness of CAD Drawings as they relate to the Contract Drawings.
    - b. CAD Software Program: The Contract Drawings are available in AutoCad 2010.
- C. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
  2. Record CAD Drawings: Organize CAD information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each CAD file.
  3. Identification: As follows:
    - a. Project name.
    - b. Date.
    - c. Designation "PROJECT RECORD DRAWINGS."
    - d. Name of Architect and Construction Manager.
    - e. Name of Contractor.

## **2.02 RECORD SPECIFICATIONS**

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
  3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
  4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
  5. Note related Change Orders, Record Product Data, and Record Drawings where applicable.

## **2.03 RECORD PRODUCT DATA**

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.

3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

#### **2.04 MISCELLANEOUS RECORD SUBMITTALS**

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

### **PART 3 - EXECUTION**

#### **3.01 RECORDING AND MAINTENANCE**

- A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.
- B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's and Construction Manager's reference during normal working hours.

**END OF SECTION**



**SECTION 01 78 20**  
**OPERATION AND MAINTENANCE DATA**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
  - 1. Operation manuals for systems, subsystems, and equipment.
  - 2. Maintenance manuals for the care and maintenance of products, materials, and finishes, systems and equipment.

**1.02 DEFINITIONS**

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

**1.03 SUBMITTALS**

- A. Submittal: Submit one copy of each manual in final form at least 15 days before final inspection. Architect will return copy with comments within 15 days after final inspection.
  - 1. Correct or modify each manual to comply with Architect's comments. Submit 3 copies of each corrected manual within 15 days of receipt of Architect's comments.

**1.04 COORDINATION**

- A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

**PART 2 - PRODUCTS**

**2.01 MANUALS, GENERAL**

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
  - 1. Title page.
  - 2. Table of contents.
  - 3. Manual contents.
- B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:
  - 1. Subject matter included in manual.
  - 2. Name and address of Project.
  - 3. Name and address of Owner.
  - 4. Date of submittal.
  - 5. Name, address, and telephone number of Contractor.
  - 6. Name and address of Architect.
  - 7. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
  - 1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
  - 1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on

spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

- a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
  - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
  3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
  4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
  5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
    - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
    - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

## 2.02 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
  1. System, subsystem, and equipment descriptions.
  2. Operating standards.
  3. Operating procedures.
  4. Operating logs.
  5. Wiring diagrams.
  6. Control diagrams.
  7. Piped system diagrams.
  8. Precautions against improper use.
  9. License requirements including inspection and renewal dates.
- B. Descriptions: Include the following:
  1. Product name and model number.
  2. Manufacturer's name.
  3. Equipment identification with serial number of each component.
  4. Equipment function.
  5. Operating characteristics.
  6. Limiting conditions.
  7. Performance curves.
  8. Engineering data and tests.
  9. Complete nomenclature and number of replacement parts.
- C. Operating Procedures: Include the following, as applicable:
  1. Startup procedures.
  2. Equipment or system break-in procedures.
  3. Routine and normal operating instructions.
  4. Regulation and control procedures.
  5. Instructions on stopping.
  6. Normal shutdown instructions.
  7. Seasonal and weekend operating instructions.

- 8. Required sequences for electric or electronic systems.
- 9. Special operating instructions and procedures.
- D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

### **2.03 PRODUCT MAINTENANCE MANUAL**

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Source Information: List each product included in manual identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Product Information: Include the following, as applicable:
  - 1. Product name and model number.
  - 2. Manufacturer's name.
  - 3. Color, pattern, and texture.
  - 4. Material and chemical composition.
  - 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
  - 1. Inspection procedures.
  - 2. Types of cleaning agents to be used and methods of cleaning.
  - 3. List of cleaning agents and methods of cleaning detrimental to product.
  - 4. Schedule for routine cleaning and maintenance.
  - 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
  - 1. Include procedures to follow and required notifications for warranty claims.

### **2.04 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL**

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
  - 1. Standard printed maintenance instructions and bulletins.
  - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
  - 3. Identification and nomenclature of parts and components.
  - 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
  - 1. Test and inspection instructions.

2. Troubleshooting guide.
  3. Precautions against improper maintenance.
  4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  5. Aligning, adjusting, and checking instructions.
  6. Demonstration and training videotape, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
  2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

### **PART 3 - EXECUTION**

#### **3.01 MANUAL PREPARATION**

- A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- B. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
  2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- C. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- D. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.
1. Do not use original Project Record Documents as part of operation and maintenance manuals.
- E. Comply with Section 01770 - CLOSEOUT PROCEDURES for schedule for submitting operation and maintenance documentation.

**END OF SECTION**

**SECTION 03 10 00**  
**CONCRETE FORMING AND ACCESSORIES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Formwork for cast-in place concrete, with shoring, bracing and anchorage.
- B. Openings for other work.
- C. Form accessories.
- D. Form stripping.

**1.02 REFERENCE STANDARDS**

- A. ACI 117 - Standard Specifications for Tolerances for Concrete Construction and Materials; American Concrete Institute; 2006.
- B. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute; 2010.
- C. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; American Concrete Institute; 2008.
- D. ACI 347 - Guide to Formwork for Concrete; American Concrete Institute; 2004.
- E. PS 1 - Structural Plywood; 2007.

**1.03 QUALITY ASSURANCE**

- A. Perform work of this section in accordance with ACI 301, 318, and 347

**PART 2 PRODUCTS**

**2.01 FORMWORK - GENERAL**

- A. Provide concrete forms, accessories, shoring, and bracing as required to accomplish cast-in-place concrete work.
- B. Design and construct to provide resultant concrete that conforms to design with respect to shape, lines, and dimensions.
- C. Comply with applicable State and local codes with respect to design, fabrication, erection, and removal of formwork.
- D. Comply with relevant portions of ACI 347, ACI 301, and ACI 318.

**2.02 WOOD FORM MATERIALS**

- A. Form Materials: At the discretion of the Contractor.

**2.03 PREFABRICATED FORMS**

- A. Preformed Steel Forms: Matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.
- B. Glass Fiber Fabric Reinforced Plastic Forms: Matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished concrete surfaces.

**2.04 FORMWORK ACCESSORIES**

- A. Form Ties: Snap-off type, metal, cone type, one inch (25 mm) back break dimension, free of defects that could leave holes larger than 1 inch (25 mm) in concrete surface.
- B. Form Release Agent: Capable of releasing forms from hardened concrete without staining or discoloring concrete or forming bugholes and other surface defects, compatible with concrete and form materials, and not requiring removal for satisfactory bonding of coatings to be applied.
- C. Form Release Agent: Colorless mineral oil that will not stain concrete, absorb moisture, impair natural bonding of concrete finish coatings, or affect color characteristics of concrete finish coatings.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

### **3.02 EARTH FORMS**

- A. Hand trim sides and bottom of earth forms. Remove loose soil prior to placing concrete.

### **3.03 ERECTION - FORMWORK**

- A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.
- B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.
- C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.
- D. Align joints and make watertight. Keep form joints to a minimum.
- E. Obtain approval before framing openings in structural members that are not indicated on drawings.

### **3.04 APPLICATION - FORM RELEASE AGENT**

- A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
- B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.

### **3.05 INSERTS, EMBEDDED PARTS, AND OPENINGS**

- A. Provide formed openings where required for items to be embedded in passing through concrete work.
- B. Locate and set in place items that will be cast directly into concrete.
- C. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other work.

### **3.06 FORM CLEANING**

- A. Clean forms as erection proceeds, to remove foreign matter within forms.
- B. Clean formed cavities of debris prior to placing concrete.
  - 1. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.

### **3.07 FORMWORK TOLERANCES**

- A. Construct formwork to maintain tolerances required by ACI 117.

### **3.08 FIELD QUALITY CONTROL**

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00.
- B. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and to verify that supports, fastenings, wedges, ties, and items are secure.

### **3.09 FORM REMOVAL**

- A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.
- B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
- C. Store removed forms to prevent damage to form materials or to fresh concrete. Discard damaged forms.

## **END OF SECTION**

**SECTION 03 20 00**  
**CONCRETE REINFORCING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Reinforcing steel for cast-in-place concrete.
- B. Supports and accessories for steel reinforcement.

**1.02 REFERENCE STANDARDS**

- A. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International; 2010.
- B. ACI 318 - Building Code Requirements For Structural Concrete and Commentary; American Concrete Institute International; 2008.
- C. ACI SP-66 - ACI Detailing Manual; American Concrete Institute International; 2004.
- D. ASTM A615/A615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 2009b.
- E. ASTM A706/A706M - Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement; 2009b.
- F. AWS D1.4/D1.4M - Structural Welding Code - Reinforcing Steel; American Welding Society; 2005.
- G. CRSI (DA4) - Manual of Standard Practice; Concrete Reinforcing Steel Institute; 2001.
- H. CRSI (P1) - Placing Reinforcing Bars; Concrete Reinforcing Steel Institute; Eighth Edition.

**1.03 SUBMITTALS**

- A. Shop Drawings: Include bar schedules, shapes of bent bars, spacing of bars, and location of splices.

**1.04 QUALITY ASSURANCE**

- A. Provide Multitech Architects Engineers/Engineer with access to fabrication plant to facilitate inspection of reinforcement. Provide notification of commencement and duration of shop fabrication in sufficient time to allow inspection.
- B. Welders' Certificates: Submit certifications for welders employed on the project, verifying AWS qualification within the previous 12 months.

**PART 2 PRODUCTS**

**2.01 REINFORCEMENT**

- A. Reinforcing Steel: ASTM A615/A615M Grade 60 (420).
  - 1. Deformed billet-steel bars.
  - 2. Unfinished.
- B. Reinforcement Accessories:
  - 1. Tie Wire: Annealed, minimum 16 gage.
  - 2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
  - 3. Provide stainless steel or plastic coated steel components for placement as required at weathering surfaces.

**2.02 FABRICATION**

- A. Fabricate concrete reinforcing in accordance with ACI 318.
- B. Locate reinforcing splices not indicated on drawings at point of minimum stress.
  - 1. Review locations of splices with Multitech Architects Engineers.

## **PART 3 EXECUTION**

### **3.01 PLACEMENT**

- A. Place, support and secure reinforcement against displacement. Do not deviate from required position.
- B. Do not displace or damage vapor barrier.
- C. Accommodate placement of formed openings.
- D. Conform to applicable code for concrete cover over reinforcement.

### **3.02 FIELD QUALITY CONTROL**

- A. An independent testing agency, as specified in Section 01 40 00, will inspect installed reinforcement for conformance to contract documents before concrete placement.

**END OF SECTION**

**SECTION 03 30 00**  
**CAST-IN-PLACE CONCRETE**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Floors and slabs on grade.
- B. Cast-in-place concrete foundation.
- C. Concrete foundations and anchor bolts for pre-engineered building.
- D. Joint devices associated with concrete work.
- E. Miscellaneous concrete elements, including equipment pads, light pole bases, flagpole bases, thrust blocks, and manholes.
- F. Concrete curing.

**1.02 REFERENCE STANDARDS**

- A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; American Concrete Institute International; 1991 (Reapproved 2002).
- B. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International; 2010.
- C. ACI 302.1R - Guide for Concrete Floor and Slab Construction; American Concrete Institute International; 2004 (Errata 2007).
- D. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute International; 2000.
- E. ACI 305R - Hot Weather Concreting; American Concrete Institute International; 2010.
- F. ACI 306R - Cold Weather Concreting; American Concrete Institute International; 2010.
- G. ACI 308R - Guide to Curing Concrete; American Concrete Institute International; 2001.
- H. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; American Concrete Institute International; 2008.
- I. ASTM C33 - Standard Specification for Concrete Aggregates; 2011.
- J. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2011.
- K. ASTM C150 - Standard Specification for Portland Cement; 2011.
- L. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a.
- M. ASTM C 494/C 494M - Standard Specification for Chemical Admixtures for Concrete; 2008.
- N. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2005.

**1.03 SUBMITTALS**

- A. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
- B. Manufacturer's Installation Instructions: For concrete accessories, indicate installation procedures and interface required with adjacent construction.

**1.04 QUALITY ASSURANCE**

- A. Perform work of this section in accordance with ACI 301 and ACI 318.
- B. Follow recommendations of ACI 305R when concreting during hot weather.
- C. Follow recommendations of ACI 306R when concreting during cold weather.

**PART 2 PRODUCTS**

**2.01 FORMWORK**

- A. Comply with requirements of Section 03 10 00.

## **2.02 REINFORCEMENT**

- A. Comply with requirements of Section 03 20 00.

## **2.03 CONCRETE MATERIALS**

- A. Cement: ASTM C150, Type I - Normal Portland type.
- B. Fine and Coarse Aggregates: ASTM C 33.
- C. Fly Ash: ASTM C618, Class C or F.
- D. Water: Clean and not detrimental to concrete.

## **2.04 CHEMICAL ADMIXTURES**

- A. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.
- B. Air Entrainment Admixture: ASTM C260.
- C. High Range Water Reducing and Retarding Admixture: ASTM C494/C494M Type G.
- D. High Range Water Reducing Admixture: ASTM C494/C494M Type F.
- E. Water Reducing and Accelerating Admixture: ASTM C494/C494M Type E.
- F. Water Reducing and Retarding Admixture: ASTM C494/C494M Type D.
- G. Accelerating Admixture: ASTM C494/C494M Type C.
- H. Retarding Admixture: ASTM C494/C494M Type B.
- I. Water Reducing Admixture: ASTM C494/C494M Type A.

## **2.05 BONDING AND JOINTING PRODUCTS**

- A. Joint Filler: Asphalt impregnated fiberboard or felt, complying with ASTM D 1751 or ASTM D994.,

## **2.06 CURING MATERIALS**

- A. Curing Compound, Naturally Dissipating: Clear, water-based, liquid membrane-forming compound, that dissipates within 3 to 5 weeks; complying with ASTM C309.

## **2.07 CONCRETE MIX DESIGN**

- A. Select proportions for normal weight concrete in accordance with ACI 301 Method 1
- B. Use accelerating admixtures in cold weather only when approved by Engineer. Use of admixtures will not relax cold weather placement requirements.
- C. Use calcium chloride only when approved by Engineer.
- D. Use set retarding admixtures during hot weather only when approved by Engineer.
- E. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended by manufacturer.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify lines, levels, and dimensions before proceeding with work of this section.

### **3.02 PLACING CONCRETE**

- A. Place concrete in accordance with ACI 304R, ACI 301 and ACI 318.
- B. Notify Multatech Architects Engineers/Engineer not less than 24 hours prior to commencement of placement operations.
- C. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.

### **3.03 SLAB JOINTING**

- A. Locate joints as indicated on the drawings.

- B. Anchor joint fillers and devices to prevent movement during concrete placement.
- C. Install joint devices in accordance with manufacturer's instructions.
- D. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
- E. Place concrete continuously between predetermined expansion, control, and construction joints.
- F. Do not interrupt successive placement; do not permit cold joints to occur, except as detailed.

### **3.04 CONCRETE FINISHING**

- A. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch or more in height. Provide finish as follows:
  - 1. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.
- B. Finish concrete floor surfaces in accordance with ACI 301.

### **3.05 CURING AND PROTECTION**

- A. Comply with requirements of ACI 308. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
- C. Spraying: Spray water over floor slab areas and maintain wet for three (3) days.

### **3.06 FIELD QUALITY CONTROL**

- A. Provide free access to concrete operations at project site and cooperate with appointed firm.
- B. Submit proposed mix design may be performed to ensure conformance with specified requirements..
- C. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.
- D. Four concrete test cylinders will be taken for every 50 cubic yards of concrete placed.
- E. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
- F. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.

### **3.07 PATCHING**

- A. Allow Architect/Engineer to inspect concrete surface immediately upon removal of forms.
- B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Architect/Engineer upon discovery.
- C. Patch imperfections as directed.

### **3.08 DEFECTIVE CONCRETE**

- A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
- B. Repair or replacement of defective concrete will be determined by the Architect/Engineer.
- C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Multatech Architects Engineers/Engineer for each individual area.

**END OF SECTION**



**SECTION 05 50 00**  
**METAL FABRICATIONS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Shop fabricated steel items.
- B. Steel framing and supports for countertops.
- C. Steel framing and supports for mechanical and electrical equipment.
- D. Steel framing and supports for applications not specified in other Sections.
- E. Metal bollards.

**1.02 REFERENCE STANDARDS**

- A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2008.
- B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2010.
- C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2009.
- D. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.
- E. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2003 (Reapproved 2007).
- F. ASTM A 325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2007a.
- G. ASTM A 325M - Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Tensile Strength (Metric); 2007.
- H. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2006 and Errata.
- I. SSPC-Paint 15 - Steel Joist Shop Primer; Society for Protective Coatings; 1999 (Ed. 2004).
- J. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 2002 (Ed. 2004).
- K. SSPC-SP 2 - Hand Tool Cleaning; Society for Protective Coatings; 1982 (Ed. 2004).

**PART 2 PRODUCTS**

**2.01 MATERIALS - STEEL**

- A. Steel Sections: ASTM A 36/A 36M.
- B. Steel Tubing: ASTM A 500, Grade B cold-formed structural tubing.
- C. Plates: ASTM A 283.
- D. Pipe: ASTM A 53/A 53M, Grade B Schedule 40, black finish.
- E. Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1 , galvanized to ASTM A 153/A 153M where connecting galvanized components.
- F. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- G. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
- H. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

**2.02 FABRICATION**

- A. Fit and shop assemble items in largest practical sections, for delivery to site.

- B. Fabricate items with joints tightly fitted and secured.
- C. Continuously seal joined members by continuous welds.
- D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

### **2.03 FABRICATED ITEMS**

- A. Bollards: Steel pipe, concrete filled and non-concrete filled, crowned cap, as detailed; galvanized finish.
- B. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Framing: For support of metal decking; prime paint finish.
- C. Lintels: As detailed; prime paint finish.
- D. Door Frames for Overhead Door Openings and Wall Openings: Channel sections; prime paint finish.
- E. Toilet Partition Suspension Members: Steel channel sections; prime paint finish.

### **2.04 FINISHES - STEEL**

- A. Prime paint all steel items.
  - 1. Exceptions: Galvanize items to be embedded in concrete or masonry.
  - 2. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.
- B. Prepare surfaces to be primed in accordance with SSPC-SP2.
- C. Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- D. Prime Painting: One coat.
- E. Galvanizing of Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements.
- F. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.

### **2.05 FABRICATION TOLERANCES**

- A. Squareness: 1/8 inch maximum difference in diagonal measurements.
- B. Maximum Offset Between Faces: 1/16 inch.
- C. Maximum Misalignment of Adjacent Members: 1/16 inch.
- D. Maximum Bow: 1/8 inch in 48 inches.
- E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

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

### **3.02 PREPARATION**

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.

### **3.03 INSTALLATION**

- A. Install items plumb and level, accurately fitted, free from distortion or defects.

- B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- C. Field weld components indicated .
- D. Perform field welding in accordance with AWS D1.1/D1.1M.
- E. Obtain approval prior to site cutting or making adjustments not scheduled.
- F. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized , except surfaces to be in contact with concrete.

#### **3.04 TOLERANCES**

- A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch.
- C. Maximum Out-of-Position: 1/4 inch.

**END OF SECTION**



**SECTION 06 10 00**  
**ROUGH CARPENTRY**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Rough opening framing for doors, windows, and roof openings.
- B. Communications and electrical room mounting boards.
- C. Concealed wood blocking, nailers, and supports.
- D. Miscellaneous wood nailers, furring, and grounds.

**1.02 REFERENCE STANDARDS**

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.
- B. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2009a.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2010b.
- D. AWPA U1 - Use Category System: User Specification for Treated Wood; American Wood Protection Association; 2010.
- E. PS 20 - American Softwood Lumber Standard; National Institute of Standards and Technology (Department of Commerce); 2005.
- F. SPIB (GR) - Grading Rules; Southern Pine Inspection Bureau, Inc.; 2002.

**1.03 DELIVERY, STORAGE, AND HANDLING**

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

**PART 2 PRODUCTS**

**2.01 GENERAL REQUIREMENTS**

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
  - 1. Species: Southern Pine, 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](http://www.alsc.org)) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.
  - 4. Lumber of other species or grades is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.

**2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS**

- A. Grading Agency: Southern Pine Inspection Bureau, Inc. (SPIB).
- B. Sizes: Nominal sizes as indicated on drawings, S4S.
- C. Moisture Content: S-dry or MC19.
- D. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
  - 1. Lumber: S4S, No. 2 or Standard Grade.
  - 2. Boards: Standard or No. 3.

**2.03 CONSTRUCTION PANELS**

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

## **2.04 ACCESSORIES**

- A. Fasteners and Anchors:
  - 1. Metal and Finish: Hot-dipped galvanized steel per ASTM A 153/A 153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
  - 2. Drywall Screws: Bugle head, hardened steel, power driven type, length three times thickness of sheathing.

## **PART 3 EXECUTION**

### **3.01 PREPARATION**

- A. Coordinate installation of rough carpentry members specified in other sections.

### **3.02 INSTALLATION - GENERAL**

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

### **3.03 BLOCKING, NAILERS, AND SUPPORTS**

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.
- C. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
- D. Specifically, provide the following non-structural framing and blocking:
  - 1. Cabinets and shelf supports.
  - 2. Wall brackets.
  - 3. Handrails.
  - 4. Grab bars.
  - 5. Towel and bath accessories.
  - 6. Wall-mounted door stops.
  - 7. Chalkboards and marker boards.
  - 8. Wall paneling and trim.
  - 9. Joints of rigid wall coverings that occur between studs.

### **3.04 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 16 inches on center on all edges and into studs in field of board.
  - 1. Install adjacent boards without gaps.
  - 2. Size and Location: Coordinate with owner.

### **3.05 TOLERANCES**

- A. Framing Members: 1/4 inch from true position, maximum.
- B. Variation from Plane (Other than Floors): 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

### **3.06 CLEANING**

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

**END OF SECTION**

**SECTION 06 41 00**  
**ARCHITECTURAL WOOD CASEWORK**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Specially fabricated cabinet units.
- B. Countertops.
- C. Cabinet hardware.
- D. Factory finishing.

**1.02 REFERENCE STANDARDS**

- A. ANSI A135.4 - American National Standard for Basic Hardboard; 2004.
- B. ANSI A208.1 - American National Standard for Particleboard; 2009.
- C. ANSI A208.2 - American National Standard for Medium Density Fiberboard for Interior Use; 2009.
- D. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2009.
- E. AWI/AWMAC (QSI) - Architectural Woodwork Quality Standards Illustrated; Architectural Woodwork Institute and Architectural Woodwork Manufacturers Association of Canada; 2005, 8th Ed., Version 2.0.
- F. BHMA A156.9 - American National Standard for Cabinet Hardware; Builders Hardware Manufacturers Association; 2010 (ANSI/BHMA A156.9).
- G. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; Hardwood Plywood & Veneer Association; 2004 (ANSI/HPVA HP-1).
- H. NEMA LD 3 - High-Pressure Decorative Laminates; National Electrical Manufacturers Association; 2005.

**1.03 SUBMITTALS**

- A. Shop Drawings: Indicate materials, component profiles and elevations, assembly methods, joint details, fastening methods, accessory listings, hardware location and schedule of finishes.
- B. Product Data: Provide data for hardware accessories.

**1.04 QUALITY ASSURANCE**

- A. Perform work in accordance with AWI/AWMAC Architectural Woodwork Quality Standards Illustrated, Custom quality, unless other quality is indicated for specific items.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
- C. Manufacturer Qualifications: Member in good standing of the Architectural Woodwork Institute (AWI) or the Architectural Woodwork Manufacturers Association of Canada (AWMAC) and familiar with the AWI/AWMAC QSI.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Protect units from moisture damage.

**1.06 FIELD CONDITIONS**

- A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

**PART 2 PRODUCTS**

**2.01 CABINETS**

- A. Quality Grade: Unless otherwise indicated provide products of quality specified by AWI/AWMAC/WI Architectural Woodwork Standards for Premium Grade.

## 2.02 PANEL MATERIALS

- A. Softwood Faced Plywood:
- B. Veneer Faced Plywood Finish: HPVA HP-1; graded in accordance with AWI/AWMAC Architectural Woodwork Quality Standards Illustrated, core of particleboard, medium density fiberboard, strawboard, or engineered combination of core materials listed; type of glue recommended for specific application; thickness as required; face veneer as follows:
- C. Medium Density Fiberboard (MDF): ANSI A208.2; type as specified in AWI/AWMAC Architectural Woodwork Quality Standards Illustrated; composed of wood fibers pressure bonded with moisture resistant adhesive to suit application; sanded faces; thickness as required.
  - 1. Use as backing for plastic laminate unless otherwise indicated.
- D. Hardboard: AHA A135.4; Pressed wood fiber with resin binder, Class 1 - Tempered, 1/4 inch thick, smooth two sides (S2S); use for drawer bottoms, dust panels, and other components indicated on drawings.
- E. Hardwood Edgebanding: Use solid hardwood edgebanding matching species, color, grain, and grade for exposed portions of cabinetry.

## 2.03 LAMINATE MATERIALS

- A. Manufacturers:
  - 1. Formica Corporation: [www.formica.com](http://www.formica.com).
  - 2. Panolam Industries International, Inc: [www.nevamar.com](http://www.nevamar.com).
  - 3. Wilsonart International, Inc: [www.wilsonart.com](http://www.wilsonart.com).
- B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications and as follows:
  - 1. Horizontal Surfaces: HGS, 0.048 inch nominal thickness, finish as scheduled.
  - 2. Vertical Surfaces: VGS, 0.028 inch nominal thickness, finish as scheduled.
  - 3. Post-Formed Horizontal Surfaces: HGP, 0.039 inch nominal thickness, finish as scheduled.
  - 4. Post-Formed Vertical Surfaces: VGP, 0.028 inch nominal thickness, finish as scheduled.
  - 5. Cabinet Liner: CLS, 0.020 inch nominal thickness, .

## 2.04 COUNTERTOPS

- A. Plastic Laminate Countertops: Medium density fiberboard substrate covered with HPDL, conventionally fabricated and self-edge banded.

## 2.05 ACCESSORIES

- A. Adhesive: Type recommended by fabricator to suit application.
- B. Fasteners: Size and type to suit application.
- C. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; chrome-plated finish in concealed locations and stainless steel finish in exposed locations.
- D. Concealed Joint Fasteners: Threaded steel.
- E. Grommets: Standard plastic grommets for cut-outs, in color to match adjacent surface.

## 2.06 HARDWARE

- A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.
- B. Adjustable Shelf Supports: Standard side-mounted system using recessed metal shelf standards and coordinated shelf rests, polished chrome finish, for nominal 1 inch spacing adjustments.
- C. Drawer and Door Pulls: "U" shaped wire pull, steel with chrome finish, 4 inch centers.
- D. Catches: Magnetic.
- E. Drawer Slides:
  - 1. Type: Full extension.

2. Static Load Capacity: Commercial grade.
  3. Mounting: Side mounted.
  4. Stops: Positive type.
  5. Manufacturers:
    - a. Accuride International, Inc: [www accuride.com](http://www accuride.com).
    - b. Grass America Inc: [www.grassusa.com](http://www.grassusa.com).
    - c. Knappe & Vogt Manufacturing Company: [www.knappeandvogt.com](http://www.knappeandvogt.com).
- F. Hinges: Concealed (fully mortised) self-closing type, steel with polished finish.
1. Manufacturers:
    - a. Grass America Inc: [www.grassusa.com](http://www.grassusa.com).
    - b. Hardware Resources: [www.hardwareresources.com](http://www.hardwareresources.com).
    - c. Julius Blum, Inc: [www.blum.com](http://www.blum.com).

## **2.07 FABRICATION**

- A. Cabinet Style: Flush overlay.
- B. Cabinet Doors and Drawer Fronts: Flush style.
- C. Drawer Construction Technique: Dovetail joints.
- D. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.
- E. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.
- F. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.
- G. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.
  1. Cap exposed plastic laminate finish edges with material of same finish and pattern.
- H. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Prime paint cut edges.

## **2.08 FACTORY FINISHING**

- A. Sand work smooth and set exposed nails and screws.
- B. For opaque finishes, apply wood filler in exposed nail and screw indentations and sand smooth.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify adequacy of backing and support framing.
- B. Verify location and sizes of utility rough-in associated with work of this section.

### **3.02 INSTALLATION**

- A. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.
- B. Use fixture attachments in concealed locations for wall mounted components.
- C. Use concealed joint fasteners to align and secure adjoining cabinet units.
- D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.
- E. Secure cabinets to floor using appropriate angles and anchorages.
- F. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

### **3.03 ADJUSTING**

- A. Adjust installed work.

B. Adjust moving or operating parts to function smoothly and correctly.

**3.04 CLEANING**

A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

**END OF SECTION**

**SECTION 07 21 00**  
**THERMAL INSULATION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Batt insulation in wall and ceiling construction.
- B. Batt insulation for filling perimeter window and door shim spaces.

**1.02 RELATED REQUIREMENTS**

- A. Section 06 10 00 - Rough Carpentry: Supporting construction for batt insulation.
- B. Section 09 21 16 - Gypsum Board Assemblies: Acoustic insulation.
- C. Section 13 34 19 Metal Building Systems

**1.03 SUBMITTALS**

- A. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

**1.04 FIELD CONDITIONS**

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

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Insulation:
  - 1. CertainTeed Corporation.
  - 2. Guardian Fiberglass, Inc.
  - 3. Johns Manville.
  - 4. Knauf fiber Glass.
  - 5. Owens Corning.

**2.02 APPLICATIONS**

- A. Insulation in Metal Framed Walls: Batt insulation with integral vapor retarder.
- B. Insulation Above Lay-In Acoustical Ceilings: Batt insulation with no vapor retarder.

**2.03 BATT INSULATION MATERIALS**

- A. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C 655; friction fit.
  - 1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
  - 2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
  - 3. Combustibility: Non-combustible, when tested in accordance with ASTM E136.
  - 4. Formaldehyde Content: Zero.
  - 5. Thermal Resistance: R-value Refer drawings.
  - 6. Manufacturers:
    - a. CertainTeed Corporation: [www.certainteed.com](http://www.certainteed.com).
    - b. Johns Manville Corporation: [www.jm.com](http://www.jm.com).
    - c. Owens Corning Corp: [www.owenscorning.com](http://www.owenscorning.com).
- B. Sound Attenuation Batt: Refer to Section 09 21 16 Gypsum Board Assemblies.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

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

### **3.02 BATT INSTALLATION**

- A. Install insulation and vapor retarder in accordance with manufacturer's instructions.
- B. Install in exterior wall spaces without gaps or voids. Do not compress insulation.
- C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.
- E. Tape insulation batts in place.
- F. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.
- G. At metal framing, place vapor retarder on warm side of insulation; lap and seal sheet retarder joints over member face.
- H. Tape seal tears or cuts in vapor retarder.
- I. Extend vapor retarder tightly to full perimeter of adjacent window and door frames and other items interrupting the plane of the membrane. Tape seal in place.

### **3.03 PROTECTION**

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

**END OF SECTION**

**SECTION 07 62 00  
METAL FLASHING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Fabricated sheet metal items, including flashings.

**1.02 REFERENCE STANDARDS**

- A. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels; 2002.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2010.
- C. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association; 2003.

**1.03 QUALITY ASSURANCE**

- A. Perform work in accordance with SMACNA Architectural Sheet Metal Manual requirements and standard details, except as otherwise indicated.

**1.04 DELIVERY, STORAGE, AND HANDLING**

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

**PART 2 PRODUCTS**

**2.01 SHEET MATERIALS**

- A. Galvanized Steel: ASTM A653/A653M, with G90/Z275 zinc coating; minimum 0.02 inch thick base metal.

**2.02 ACCESSORIES**

- A. Fasteners: Galvanized steel, with soft neoprene washers.

**2.03 FABRICATION**

- A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
- B. Form pieces in longest possible lengths.
- C. Hem exposed edges on underside 1/2 inch; miter and seam corners.
- D. Form material with flat lock seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. Conform to drawing details.
- B. Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted.
- C. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

**3.02 FIELD QUALITY CONTROL**

- A. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

**END OF SECTION**



**SECTION 07 90 05**  
**JOINT SEALERS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Sealants and joint backing.
- B. Precompressed foam sealers.

**1.02 REFERENCE STANDARDS**

- A. ASTM C834 - Standard Specification for Latex Sealants; 2010.
- B. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2011.
- C. ASTM C 1193 - Standard Guide for Use of Joint Sealants; 2005a.

**1.03 ADMINISTRATIVE REQUIREMENTS**

**1.04 SUBMITTALS**

- A. Product Data: Provide data indicating sealant chemical characteristics.

**1.05 QUALITY ASSURANCE**

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

**1.06 FIELD CONDITIONS**

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

**1.07 WARRANTY**

- A. Correct defective work within a five year period after Date of Substantial Completion.
- B. Warranty: Include coverage for installed sealants and accessories which fail to achieve airtight seal, exhibit loss of adhesion or cohesion, or do not cure.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Silicone Sealants:
  - 1. Bostik Inc: [www.bostik-us.com](http://www.bostik-us.com).
  - 2. Dow Corning Corporation
  - 3. Momentive Performance Materials, Inc (formerly GE Silicones): [www.momentive.com](http://www.momentive.com).
  - 4. Pecora Corporation: [www.pecora.com](http://www.pecora.com).
  - 5. BASF Construction Chemicals-Building Systems: [www.chemrex.com](http://www.chemrex.com).
- B. Acrylic Sealants (ASTM C920):
  - 1. Tremco Global Sealants: [www.tremcosealants.com](http://www.tremcosealants.com).
  - 2. Red Devil; Siliconized Acrylic Construction Grade (35 Year) Sealant: [www.reddevil.com](http://www.reddevil.com).
  - 3. Sherwin-Williams Company; Shermax Urethanized Elastomeric Sealant: [www.sherwin-williams.com](http://www.sherwin-williams.com).
- C. Acrylic Emulsion Latex Sealants:
  - 1. Bostik Inc: [www.bostik-us.com](http://www.bostik-us.com).
  - 2. Pecora Corporation: [www.pecora.com](http://www.pecora.com).
  - 3. BASF Construction Chemicals-Building Systems: [www.chemrex.com](http://www.chemrex.com).
  - 4. Sonneborn, Division of ChemRex, Inc.; Sonolac .

## 2.02 SEALANTS

- A. General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C834, Type OP, Grade NF single component, paintable.
  - 1. Color: Standard colors matching finished surfaces.
  - 2. Product: Chem-Calk 600 manufactured by Bostik Findley
  - 3. Product: AC-20+ manufactured by Pecora Corporation
  - 4. Product: Sonolac manufactured by Sonneborn, Division of ChemRex, Inc.
  - 5. Product: Tremflex 834 manufactured by Tremco.
  - 6. Applications: Use for:
    - a. Interior wall and ceiling control joints.
    - b. Joints between door and window frames and wall surfaces.
    - c. Other interior joints for which no other type of sealant is indicated.
- B. Bathtub/Tile Sealant: White silicone; ASTM C920, Uses I, M and A; single component, mildew resistant.
- C. Type P - Acrylic Emulsion Latex: ASTM C834, single component, non-staining, non-bleeding, non-sagging.
  - 1. Color: Standard colors matching finished surfaces, Type OP (opaque).
  - 2. Product: Chem-Calk 600 manufactured by Bostik Findley.
  - 3. Product: AC-20+ manufactured by Pecora Corporation.
  - 4. Product: Sonolac manufactured by Sonneborn, Division of ChemRex, Inc.
  - 5. Product: Tremflex 834 manufactured by Tremco.
  - 6. Applications: Use for:
    - a. Interior perimeter joints of metal frames in exterior walls.
    - b. Interior joints in gypsum drywall.
    - c. All other interior joints not otherwise specified.
- D. Type S - Nonsag Polyurethane Sealant: ASTM C920, Grade NS, Class 25, Uses NT, I, M, A ; single component, chemical curing, non-staining, non bleeding, non-sagging type.
  - 1. Color: Standard colors matching finished surfaces.
  - 2. Product: Chem-Calk 900 manufactured by Bostik Findley.
  - 3. Product: Dynatrol 1-XL manufactured by Pecora Corporation.
  - 4. Product: DyMonic manufactured by Tremco.
  - 5. Applications: Use for:
    - a. Interior joints in field-painted vertical and overhead surfaces at the perimeter of hollow metal door frames.
- E. Type M - Self-Leveling Polyurethane Sealant: ASTM C920, Grade P, Class 25, Uses T, I, M, A ; multi- component, chemical curing, non staining, non bleeding, self-leveling type.
  - 1. Color: Gray.
  - 2. Product: Chem-Calk 550 manufactured by Bostik Findley.
  - 3. Product: POURTHANE manufactured by W. R. Meadows, Inc.
  - 4. Product: Urexpan NR-200 manufactured by Pecora Corporation
  - 5. Product: THC-900 manufactured by Tremco.
  - 6. Applications: Use for:
    - a. Exterior and interior joints in horizontal surfaces of concrete.
    - b. Exterior and interior joints between metal and concrete.

## 2.03 ACCESSORIES

- A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
- B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- C. Joint Backing: Round foam rod compatible with sealant; ASTM D 1667, closed cell PVC; oversized 30 to 50 percent larger than joint width.

- D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

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

#### **3.02 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.

#### **3.03 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. Perform acoustical sealant application work in accordance with ASTM C919.
- D. Install bond breaker where joint backing is not used.
- E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- G. Tool joints concave.

#### **3.04 CLEANING**

- A. Clean adjacent soiled surfaces.

#### **3.05 PROTECTION**

- A. Protect sealants until cured.

**END OF SECTION**



**SECTION 08 11 13**  
**HOLLOW METAL DOORS AND FRAMES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Non-fire-rated steel doors and frames.
- B. Steel frames for wood doors.
- C. Thermally insulated steel doors.
- D. Steel glazing frames.
- E. Accessories, including glazing.

**1.02 REFERENCE STANDARDS**

- A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2003.
- B. ANSI A250.3 - Test Procedure and Acceptance Criteria for Factory-Applied Finish Painted Steel Surfaces for Steel Doors and Frames; 2007.
- C. ANSI A250.8 - SDI-100 Recommended Specifications for Standard Steel Doors and Frames; 2003.
- D. ANSI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 1998 (R2004).
- E. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2010.
- F. ASTM C1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus; 2005.
- G. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009.
- H. ASTM E413 - Classification for Rating Sound Insulation; 2010.
- I. ASTM E1408 - Standard Test Method for Laboratory Measurement of the Sound Transmission Loss of Door Panels and Door Systems; 1991 (Reapproved 2000).
- J. BHMA A156.115 - Hardware Preparation in Steel Doors and Steel Frames; 2006.
- K. NAAMM HMMA 840 - Guide Specifications for Installation and Storage of Hollow Metal Doors and Frames; The National Association of Architectural Metal Manufacturers; 2007.
- L. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; The National Association of Architectural Metal Manufacturers; 2006.
- M. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2010.
- N. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association; 2008.
- O. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; current edition.
- P. UL 10B - Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

**1.03 SUBMITTALS**

- A. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced grade standard.

**1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Maintain at the project site a copy of all reference standards dealing with installation.

## **1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Store in accordance with NAAMM HMMA 840.
- B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Steel Doors and Frames:
  - 1. Assa Abloy Ceco or Fleming: [www.assaabloydss.com](http://www.assaabloydss.com).
  - 2. Windsor Republic Doors: [www.republicdoor.com](http://www.republicdoor.com).
  - 3. Steelcraft; an Ingersoll-Rand Company: [www.steelcraft.com](http://www.steelcraft.com).
  - 4. Provide equal to listed products.

### **2.02 DOORS AND FRAMES**

- A. Requirements for All Doors and Frames:
  - 1. Accessibility: Comply with ANSI/ICC A117.1.
  - 2. Door Top Closures: Flush with top of faces and edges.
  - 3. Door Edge Profile: Beveled on both edges.
  - 4. Door Texture: Smooth faces.
  - 5. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
  - 6. Hardware Preparation: In accordance with BHMA A156.115, with reinforcement welded in place, in addition to other requirements specified in door grade standard.
  - 7. Galvanizing for Units in Wet Areas: All components hot-dipped zinc-iron alloy-coated (galvannealed), manufacturer's standard coating thickness.
  - 8. Finish: Factory primed, for field finishing.

### **2.03 STEEL DOORS**

- A. Exterior Doors :
  - 1. Grade: NAAMM HMMA 861, physical performance Level A.
  - 2. Core: Polystyrene foam.
  - 3. Insulating Value: U-value of 0.50, when tested in accordance with ASTM C1363.
  - 4. Weatherstripping: Separate, see Section 08 71 00.
  - 5. Finish: Factory primed, for field finishing.
- B. Interior Doors :
  - 1. Grade: ANSI A250.8 Level 2, physical performance Level B, Model 2, seamless.
  - 2. Core: Cardboard honeycomb.
  - 3. Thickness: 1-3/4 inches.
  - 4. Texture: Smooth faces.
  - 5. Finish: Factory primed, for field finishing.

### **2.04 STEEL FRAMES**

- A. General:
  - 1. Comply with the requirements of grade specified for corresponding door.
  - 2. Finish: Same as for door.
  - 3. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inches high to fill opening without cutting masonry units.
  - 4. Frames Wider than 48 Inches: Reinforce with steel channel fitted tightly into frame head, flush with top.
- B. Exterior Door Frames: Face welded, seamless with joints filled.
  - 1. Finish: Factory primed, for field finishing.
  - 2. Weatherstripping: Separate, see Section 08 71 00.
- C. Interior Door Frames : Knock-down type.

- D. Frames for Interior Glazing or Borrowed Lights: Construction and face dimensions to match door frames, and as indicated on drawings.

## **2.05 ACCESSORY MATERIALS**

- A. Glazing: As specified in Section 08 80 00 , factory installed.
- B. Removable Stops: Formed sheet steel, mitered or butted corners ; prepared for countersink style tamper proof screws.
- C. Astragals for Double Doors: Specified in Section 08 71 00.
  - 1. Exterior Doors: Steel, Z-shaped.
- D. Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.
- E. Temporary Frame Spreaders: Provide for all factory- or shop-assembled frames.

## **2.06 FINISH MATERIALS**

- A. Primer: Rust-inhibiting, complying with ANSI A250.10 , door manufacturer's standard.
- B. Factory Finish: Complying with ANSI A 250.3, manufacturer's standard coating.
  - 1. Color: As shown on drawings.
- C. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.

### **3.02 INSTALLATION**

- A. Install in accordance with the requirements of the specified door grade standard and NAAMM HMMA 840.
- B. Coordinate frame anchor placement with wall construction.
- C. Coordinate installation of hardware.
- D. Coordinate installation of glazing.
- E. Touch up damaged factory finishes.

### **3.03 TOLERANCES**

- A. Maximum Diagonal Distortion: 1/16 in measured with straight edge, corner to corner.

### **3.04 ADJUSTING**

- A. Adjust for smooth and balanced door movement.

**END OF SECTION**



**SECTION 08 14 16**  
**FLUSH WOOD DOORS**

**PART 1 GENERAL**

**1.01 REFERENCE STANDARDS**

- A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2009.
- B. AWMAC (GIS) - Guarantee and Inspection Services Program; current edition at [www.awmac.com/gis.php](http://www.awmac.com/gis.php).
- C. AWI/AWMAC (QSI) - Architectural Woodwork Quality Standards Illustrated; Architectural Woodwork Institute and Architectural Woodwork Manufacturers Association of Canada; 2005, 8th Ed., Version 2.0.
- D. WDMA I.S.1-A - Architectural Wood Flush Doors; Window and Door Manufacturers Association; 2004.

**1.02 SUBMITTALS**

- A. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.
- B. Specimen warranty.
- C. Samples: Submit two samples of door veneer, 12 by 12 inch in size illustrating wood grain, stain color, and sheen.
- D. Manufacturer's Installation Instructions: Indicate special installation instructions.
- E. Warranty, executed in New Barite Plant's name.

**1.03 QUALITY ASSURANCE**

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

**1.04 DELIVERY, STORAGE, AND HANDLING**

- A. Package, deliver and store doors in accordance with specified quality standard.
- B. Accept doors on site in manufacturer's packaging. Inspect for damage.
- C. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer if stored more than one week. Break seal on site to permit ventilation.

**1.05 WARRANTY**

- A. Interior Doors: Provide manufacturer's warranty for the life of the installation.
- B. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Wood Veneer Faced Doors:
  - 1. Algoma Hardwoods, Inc.
  - 2. Buell Door Company
  - 3. Eggers Industries: [www.eggersindustries.com](http://www.eggersindustries.com).
  - 4. Mohawk Flush Door, Inc.
  - 5. Weyerhaeuser Company
  - 6. Haley Brothers: [www.haleybros.com](http://www.haleybros.com).
  - 7. Marshfield DoorSystems, Inc: [www.marshfielddoors.com](http://www.marshfielddoors.com).
  - 8. Provide equal to listed products.

**2.02 DOORS**

- A. All Doors: See drawings for locations and additional requirements.

1. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.
- B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
  1. Provide solid core doors at all locations .
  2. Wood veneer facing for field transparent finish .

### **2.03 DOOR AND PANEL CORES**

- A. Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC), plies and faces as indicated above.

### **2.04 DOOR FACINGS**

- A. Wood Veneer Facing for Transparent Finish: White birch, veneer grade as specified by quality standard, rotary cut, slip veneer match, running assembly match; unless otherwise indicated.
  1. Vertical Edges: Any option allowed by quality standard for grade.
  2. Pairs: Pair match each pair; set match pairs within 10 feet of each other when doors are closed.

### **2.05 ACCESSORIES**

- A. Glazing Stops: Rolled steel channel shape, mitered corners; prepared for countersink style tamper proof screws.
- B. Astragals for Non-Rated Double Doors: Steel, T shaped at face edge.

### **2.06 DOOR CONSTRUCTION**

- A. Fabricate doors in accordance with door quality standard specified.
- B. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.
- C. Provide edge clearances in accordance with the quality standard specified.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

### **3.02 INSTALLATION**

- A. Install doors in accordance with manufacturer's instructions and specified quality standard.
- B. Use machine tools to cut or drill for hardware.
- C. Coordinate installation of doors with installation of frames and hardware.
- D. Coordinate installation of glazing.

### **3.03 TOLERANCES**

- A. Conform to specified quality standard for fit and clearance tolerances.
- B. Conform to specified quality standard for telegraphing, warp, and squareness.

### **3.04 ADJUSTING**

- A. Adjust doors for smooth and balanced door movement.
- B. Adjust closers for full closure.

**END OF SECTION**

**SECTION 08 31 00**  
**ACCESS DOORS AND PANELS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Access door and frame units, non-fire-rated, in wall and ceiling locations.

**1.02 REFERENCE STANDARDS**

- A. ITS (DIR) - Directory of Listed Products; Intertek Testing Services NA, Inc.; current edition.

**1.03 SUBMITTALS**

- A. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Access Doors:
  1. Acudor Products Inc: [www.acudor.com](http://www.acudor.com).
  2. Babcock-Davis; a Cierra products Company.
  3. Dur-Red products.
  4. J. L. Industries, Inc.
  5. Karp Associates, Inc: [www.karpinc.com](http://www.karpinc.com).
  6. Larsen's Manufacturing Company
  7. Milcor Inc: [www.milcorinc.com](http://www.milcorinc.com).
  8. Nystrom, Inc. .

**2.02 ACCESS DOORS AND PANELS**

- A. All Units: Factory fabricated, fully assembled units with corner joints welded, filled, and ground flush; square and without rack or warp; coordinate requirements with assemblies units are to be installed in.

**2.03 WALL AND CEILING UNITS**

- A. Door and Frame Units: Factory fabricated, fully assembled units with corner joints welded, filled, and ground flush; square and without rack or warp; coordinate requirements with assemblies units are to be installed in.
  1. Material: Steel.
- B. Door and Frame Units: Formed steel.
  1. Frames and flanges: 0.058 inch steel.
  2. Door panels: 0.60 inch single thickness steel sheet.
  3. Minimum Sizes:
    - a. Walls: 12 x 12 inches.
    - b. Ceilings: 12 x 12 inches.
  4. Hardware:
    - a. Hinge: Non-Fire-Rated Units: 175 degree steel hinges with removable pin.
    - b. Hinge: 175 degree stainless steel piano hinge with pin.
  5. Prime coat with alkyd primer.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify that rough openings are correctly sized and located.

**3.02 INSTALLATION**

- A. Install units in accordance with manufacturer's instructions.
- B. Install frames plumb and level in openings. Secure rigidly in place.

C. Position units to provide convenient access to the concealed work requiring access.

**END OF SECTION**

**SECTION 08 51 13**  
**ALUMINUM WINDOWS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Extruded aluminum horizontal sliding windows.
- B. Factory glazing.
- C. Operating hardware.
- D. Insect screens.

**1.02 REFERENCE STANDARDS**

- A. AAMA/WDMA/CSA 101/I.S.2/A440 - Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors; American Architectural Manufacturers Association; 2005.
- B. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; American Architectural Manufacturers Association; 2004.
- C. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004.
- D. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2002 (Reapproved 2010).
- E. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2009).

**1.03 SUBMITTALS**

- A. Product Data: Provide component dimensions.
- B. Shop Drawings: Indicate opening dimensions, framed opening tolerances, method for achieving air and vapor barrier seal to adjacent construction, anchorage locations, , and installation requirements.
- C. Certificates: Certify that windows meet or exceed specified requirements.
- D. Manufacturer's Installation Instructions: Include complete preparation, installation, and cleaning requirements.

**1.04 QUALITY ASSURANCE**

- A. Manufacturer and Installer Qualifications: Company specializing in fabrication of commercial aluminum windows of types required, with not fewer than three years of experience.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Comply with requirements of AAMA CW-10.
- B. Protect finished surfaces with wrapping paper or strippable coating during installation. Do not use adhesive papers or sprayed coatings that bond to substrate when exposed to sunlight or weather.

**1.06 FIELD CONDITIONS**

- A. Do not install sealants when ambient temperature is less than 40 degrees F.
- B. Maintain this minimum temperature during and 24 hours after installation of sealants.

**1.07 WARRANTY**

- A. Correct defective Work within a five year period after Date of Substantial Completion.
- B. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

- C. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Aluminum Windows:
  - 1. EFCO Corporation; Product Series 3500 XO: [www.efcocorp.com](http://www.efcocorp.com)
  - 2. Kawneer, an Alcoa Company; Product AA 3350 IsoPort Horizontal slider
  - 3. Peerless Products, Inc; Product Series 9530: [www.peerlessproducts.com](http://www.peerlessproducts.com).
  - 4. Provide equal to listed products.

### **2.02 WINDOWS**

- A. Windows: Tubular aluminum sections, factory fabricated, factory finished, thermally broken, vision glass, related flashings, anchorage and attachment devices.

### **2.03 FABRICATION**

- A. Fabricate components with smallest possible clearances and shim spacing around perimeter of assembly that will enable window installation and dynamic movement of perimeter seal.
- B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.
- C. Prepare components to receive anchor devices.
- D. Arrange fasteners and attachments to ensure concealment from view.
- E. Prepare components with internal reinforcement for operating hardware.
- F. Factory glaze window units.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that wall openings and adjoining air and vapor seal materials are ready to receive aluminum windows.

### **3.02 INSTALLATION**

- A. Install windows in accordance with manufacturer's instructions.
- B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.
- C. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.
- D. Install sill and sill end angles.
- E. Provide thermal isolation where components penetrate or disrupt building insulation. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- F. Coordinate attachment and seal of perimeter air barrier and vapor retarder materials.
- G. Install perimeter sealant in accordance with requirements specified in Section 07 90 05.

### **3.03 TOLERANCES**

- A. Maximum Variation from Level or Plumb: 1/16 inches every 3 ft non-cumulative or 1/8 inches per 10 ft, whichever is less.

### **3.04 ADJUSTING**

- A. Adjust hardware for smooth operation and secure weathertight closure.

### **3.05 CLEANING**

- A. Remove protective material from factory finished aluminum surfaces.
- B. Wash surfaces by method recommended and acceptable to sealant and window manufacturer; rinse and wipe surfaces clean.

- C. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant and window manufacturer.

**END OF SECTION**



**SECTION 08 71 00**  
**DOOR HARDWARE**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Hardware for wood and hollow steel doors.
- B. Thresholds.
- C. Weatherstripping, seals and door gaskets.

**1.02 REFERENCE STANDARDS**

- A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2003.
- B. BHMA A156.1 - American National Standard for Butts and Hinges; Builders Hardware Manufacturers Association, Inc.; 2006 (ANSI/BHMA A156.1).
- C. BHMA A156.2 - American National Standard for Bored and Preassembled Locks & Latches; Builders Hardware Manufacturers Association; 2003 (ANSI/BHMA A156.2).
- D. BHMA A156.3 - American National Standard for Exit Devices; Builders Hardware Manufacturers Association; 2001 (ANSI/BHMA A156.3).
- E. BHMA A156.4 - American National Standard for Door Controls - Closers; Builders Hardware Manufacturers Association, Inc.; 2000 (ANSI/BHMA A156.4).
- F. BHMA A156.6 - American National Standard for Architectural Door Trim; Builders Hardware Manufacturers Association; 2005 (ANSI/BHMA A156.6).
- G. BHMA A156.7 - American National Standard for Template Hinge Dimensions; Builders Hardware Manufacturers Association; 2003 (ANSI/BHMA A156.7).
- H. BHMA A156.8 - American National Standard for Door Controls - Overhead Stops and Holders; Builders Hardware Manufacturers Association, Inc.; 2005 (ANSI/BHMA A156.8).
- I. BHMA A156.9 - American National Standard for Cabinet Hardware; Builders Hardware Manufacturers Association; 2010 (ANSI/BHMA A156.9).
- J. BHMA A156.13 - American National Standard for Mortise Locks & Latches; Builders Hardware Manufacturers Association; 2005 (ANSI/BHMA A156.13).
- K. BHMA A156.18 - American National Standard for Materials and Finishes; Builders Hardware Manufacturers Association, Inc.; 2006 (ANSI/BHMA A156.18).
- L. BHMA A156.21 - American National Standard for Thresholds; Builders Hardware Manufacturers Association; 2009 (ANSI/BHMA A156.21).
- M. BHMA A156.22 - American National Standard for Door Gasketing and Edge Seal Systems, Builders Hardware Manufacturers Association; 2005 (ANSI/BHMA A156.22).
- N. BHMA A156.115 - Hardware Preparation in Steel Doors and Steel Frames; 2006.
- O. BHMA A156.115W - Hardware Preparation in Wood Doors with Wood or Steel Frames; 2006.
- P. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames; Door and Hardware Institute; 2004.
- Q. DHI WDHS.3 - Recommended Locations for Architectural Hardware for Flush Wood Doors; Door and Hardware Institute; 1993; also in WDHS-1/WDHS-5 Series, 1996.
- R. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures; National Fire Protection Association; 2009.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordinate the manufacture, fabrication, and installation of products onto which door hardware will be installed.

- B. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.
- C. Convey New Barite Plant's keying requirements to manufacturers.
- D. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

#### **1.04 SUBMITTALS**

- A. Shop Drawings:
  - 1. Indicate locations and mounting heights of each type of hardware, schedules and catalog cuts .
  - 2. Submit manufacturer's parts lists and templates.
- B. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.
- C. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
- D. Keys: Deliver with identifying tags to New Barite Plant by security shipment direct from hardware supplier.
- E. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in New Barite Plant's name and registered with manufacturer.
- F. Maintenance Materials and Tools: Furnish the following for New Barite Plant's use in maintenance of project.
  - 1. Tools: One set of all special wrenches or tools applicable to each different or special hardware component, whether supplied by the hardware component manufacturer or not.

#### **1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
- B. Hardware Supplier Qualifications: Company specializing in supplying commercial door hardware with three years of experience.

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

- A. Package hardware items individually; label and identify each package with door opening code to match hardware schedule.

#### **1.07 WARRANTY**

- A. Provide five year warranty for door closers.

### **PART 2 PRODUCTS**

#### **2.01 DOOR HARDWARE - GENERAL**

- A. Provide all hardware specified or required to make doors fully functional, compliant with applicable codes, and secure to the extent indicated.
- B. Provide all items of a single type of the same model by the same manufacturer.
- C. Provide products that comply with the following:
  - 1. Applicable provisions of federal, state, and local codes.
  - 2. ANSI/ICC A117.1, American National Standard for Accessible and Usable Buildings and Facilities.
  - 3. Applicable provisions of NFPA 101, Life Safety Code.
- D. Finishes: All door hardware the same finish unless otherwise indicated.
  - 1. Primary Finish: Satin chrome plated over nickel on brass or bronze, 626 (approx US26D).
  - 2. Finish Definitions: BHMA A156.18.

#### **2.02 HINGES**

- A. Hinges: Provide hinges on every swinging door.

1. Provide five-knuckle full mortise butt hinges unless otherwise indicated.
  2. Provide ball-bearing hinges at all doors having closers.
  3. Provide hinges in the quantities indicated.
  4. Provide non-removable pins on exterior outswinging doors.
- B. Manufacturers - Hinges:
1. Heavy weight stainless steel hinges with non-removable pins at all exterior openings unless otherwise indicated
  2. Ball bearing
  3. Quantity of three hinges for doors 90 inches or less in height. Provide additional hinges at taller doors as required by door manufacturer.
  4. 626 satin chrome plated on stainless steel base at exterior. 652 brushed chrome plating on steel base at interior.
  5. Acceptable Manufacturers:
    - a. Assa Abloy McKinney: [www.assaabloydss.com](http://www.assaabloydss.com).

### **2.03 PUSH/PULLS**

- A. Push/Pulls: Comply with BHMA A156.6.
- B. Manufacturers - Push/Pulls:
1. Assa Abloy McKinney: [www.assaabloydss.com](http://www.assaabloydss.com).
  2. Hager Companies: [www.hagerco.com](http://www.hagerco.com).
  3. Hiawatha, Inc: [www.hiawathainc.com](http://www.hiawathainc.com).

### **2.04 LOCKS AND LATCHES**

- A. Locks: Provide a lock for every door, unless specifically indicated as not requiring locking.
1. Hardware Sets indicate locking functions required for each door.
  2. Trim: Provide lever handle or pull trim on outside of all locks unless specifically stated to have no outside trim.
  3. Lock Cylinders: Provide key access on outside of all locks unless specifically stated to have no locking or no outside trim.
- B. Lock Cylinders: Manufacturer's standard tumbler type, six-pin standard core.
1. Provide cams and/or tailpieces as required for locking devices required.
- C. Keying: Grand master keyed.

### **2.05 MORTISE LOCKSETS**

- A. Locking Functions: As defined in BHMA A156.13, and as follows:
- B. Manufacturers - Mortise Locksets:
1. Assa Abloy Corbin Russwin or Yale: [www.assaabloydss.com](http://www.assaabloydss.com).
  2. Best Access Systems: [www.bestlock.com](http://www.bestlock.com).
  3. Schlage: [www.schlage.com](http://www.schlage.com).

### **2.06 EXIT DEVICES**

- A. Locking Functions: Functions as defined in BHMA A156.3.
- B. Manufacturers:
1. Equip devices with dogging feature.
  2. Provide stainless steel rods and gravity type latch bolts at all vertical rod applications. Aluminum rods and painted rods with spring required latch bolts are not acceptable.
  3. Lever trim design shall be vandal resistant with forged escutcheon and preprotected cylinder. Lever shall match lockset lever design.
  4. All devices shall have an anti-pick latchbolt design.
  5. 626 satin chrome plated on stainless steel base for all components located on the push side of the opening unless indicated otherwise.
  6. Acceptable Manufacturers:
    - a. Assa Abloy Corbin Russwin, Sargent, or Yale: [www.assaabloydss.com](http://www.assaabloydss.com).

## 2.07 CLOSERS

- A. Manufacturers - Closers:
  - 1. Mount closers on non-public side of door opening. Closers shall be non-handed and non-sized for ease of installation. Handed units are not acceptable.
  - 2. Provide all functions and options as indicated. Do not provide back check relief valves.
  - 3. Provide with 1-1/2" minimum bore.
  - 4. 689 powder coated finish to match remainder of hardware.
  - 5. Acceptable Manufacturers:
    - a. Assa Abloy Norton or Sargent: [www.assaabloydss.com](http://www.assaabloydss.com).

## 2.08 STOPS AND HOLDERS

- A. Stops: Complying with BHMA A156.8; provide a stop for every swinging door, unless otherwise indicated.
  - 1. Provide wall stops, unless otherwise indicated.
  - 2. If wall stops are not practical, due to configuration of room or furnishings, provide overhead stop.
  - 3. Stop is not required if positive stop feature is specified for door closer; positive stop feature of door closer is not an acceptable substitute for a stop unless specifically so stated.
- B. Overhead Holders/Stops:
- C. Manufacturers - Wall and Floor Stops/Holders:
  - 1. Assa Abloy McKinney: [www.assaabloydss.com](http://www.assaabloydss.com).
  - 2. Hiawatha, Inc: [www.hiawathainc.com](http://www.hiawathainc.com).

## 2.09 GASKETING AND THRESHOLDS

- A. Manual Bolts:
  - 1. Assa Abloy McKinney: [www.assaabloydss.com](http://www.assaabloydss.com).
  - 2. Glynn-Johnson: [www.glynn-johnson.com](http://www.glynn-johnson.com).
- B. Gaskets: Complying with BHMA A156.22.
  - 1. On each door in smoke partition, provide smoke gaskets; top, sides, and meeting stile of pairs. If fire/smoke partitions are not indicated on drawings, provide smoke gaskets on each door identified as a "smoke door" and 20-minute rated fire doors.
  - 2. On each exterior door, provide weatherstripping gaskets, unless otherwise indicated; top, sides, and meeting stiles of pairs.
  - 3. On each exterior door, provide door bottom sweep, unless otherwise indicated.
- C. Thresholds:
  - 1. At each exterior door, provide a threshold unless otherwise indicated.
- D. Fasteners At Exterior Locations: Non-corroding.
- E. Manufacturers - Gasketing and Thresholds:
  - 1. Provide aluminum thresholds at man doors as scheduled.
  - 2. Do not provide weatherstripping with exposed fasteners that project off the face of the aluminum extrusion.
  - 3. Acceptable Manufacturers:
    - a. Assa Abloy McKinney: [www.assaabloydss.com](http://www.assaabloydss.com).
    - b. National Guard Products, Inc: [www.ngpinc.com](http://www.ngpinc.com).
    - c. Pemko Manufacturing Co: [www.pemko.com](http://www.pemko.com).
    - d. Zero International, Inc: [www.zerointernational.com](http://www.zerointernational.com).

## 2.10 PROTECTION PLATES AND ARCHITECTURAL TRIM

- A. Protection Plates:
  - 1. Kickplate: Provide on push side of every door with closer.
  - 2. Mop Plates: Provide at toilet room doors.
- B. Drip Guard: Provide projecting drip guard over all exterior doors unless they are under a projecting roof or canopy.

- C. Manufacturers - Protection Plates and Architectural Trim:
  - 1. Assa Abloy McKinney: [www.assaabloydss.com](http://www.assaabloydss.com).
  - 2. Hager Companies: [www.hagerco.com](http://www.hagerco.com).

## **2.11 GENERAL REQUIREMENTS FOR DOOR HARDWARE PRODUCTS**

- A. Provide products that comply with the following:
  - 1. Applicable provisions of Federal, State, and local codes.
  - 2. ANSI/ICC A117.1, American National Standard for Accessible and Usable Buildings and Facilities.
  - 3. Applicable provisions of NFPA 101, Life Safety Code.
  - 4. Fire-Rated Doors: NFPA 80.

## **2.12 KEYING**

- A. Door Locks: Master keyed.
  - 1. Include construction keying and control keying with removable core cylinders.
  - 2. Key to existing keying system.
- B. Supply keys in the following quantities:
  - 1. 25 construction keys.
  - 2. 5 control keys and 10 extra cylinder cores.
  - 3. 2 change keys for each lock.

## **2.13 KEY CABINET**

- A. Cabinet Construction: Sheet aluminum construction, piano hinged door with owner selected type lock master keyed to building system.
- B. Cabinet Size: Size for project keys plus 25 percent growth.
- C. Horizontal metal strips for key hook labelling with clear plastic strip cover over labels.
- D. Finish: Brushed finish, White color.
- E. Confirm location with owner.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that doors and frames are ready to receive work; labeled, fire-rated doors and frames are present and properly installed, and dimensions are as indicated on shop drawings.
- B. Verify that electric power is available to power operated devices and of the correct characteristics.

### **3.02 INSTALLATION**

- A. Install hardware in accordance with manufacturer's instructions and applicable codes.
- B. Use templates provided by hardware item manufacturer.
- C. Install hardware on fire-rated doors and frames in accordance with code and NFPA 80.
- D. Mounting heights for hardware from finished floor to center line of hardware item:
  - 1. For steel doors and frames: Comply with DHI "Recommended Locations for Architectural Hardware for Steel Doors and Frames."
  - 2. For wood doors: Comply with DHI "Recommended Locations for Architectural Hardware for Wood Flush Doors."

### **3.03 FIELD QUALITY CONTROL**

- A. Field inspection and testing will be performed under provisions of Section 01 40 00.

### **3.04 ADJUSTING**

- A. Adjust work under provisions of Section 01 70 00.
- B. Adjust hardware for smooth operation.
- C. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

**3.05 CLEANING**

- A. Clean adjacent surfaces soiled by hardware installation. Clean finished hardware per manufacturer's instructions after final adjustments has been made. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.

**3.06 PROTECTION**

- A. Protect finished Work under provisions of Section 01 70 00.
- B. Do not permit adjacent work to damage hardware or finish.

**3.07 SCHEDULE - Refer to drawings.**

**END OF SECTION**

## SECTION 08 80 00

### GLAZING

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Glass.
- B. Glazing compounds and accessories.

##### 1.02 REFERENCE STANDARDS

- A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.
- B. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005.
- C. ASTM C1036 - Standard Specification for Flat Glass; 2006.
- D. ASTM C1048 - Standard Specification for Heat-Treated Flat Glass--Kind HS, Kind FT Coated and Uncoated Glass; 2004.
- E. ASTM C 1193 - Standard Guide for Use of Joint Sealants; 2005a.
- F. GANA (SM) - FGMA Sealant Manual; Glass Association of North America; 2008.

##### 1.03 SUBMITTALS

- A. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.

#### PART 2 PRODUCTS

##### 2.01 GLAZING TYPES

- A. Type G-1 - Sealed Insulating Glass Units: Vision glazing.
  - 1. Application(s): All exterior glazing unless otherwise indicated.
  - 2. Outboard Lite: Annealed float glass, 1/4 inch thick, minimum.
    - a. Tint: Gray.
    - b. Coating: Low-E type, on #2 surface.
  - 3. Inboard Lite: Annealed float glass, 1/4 inch thick, minimum.
    - a. Tint: Clear.

##### 2.02 GLASS MATERIALS

- A. Float Glass Manufacturers:
  - 1. Zeledyne: [www.versaluxglass.com](http://www.versaluxglass.com).
  - 2. AGC Flat Glass North America, Inc: [www.afgglass.com](http://www.afgglass.com).
  - 3. Pilkington North America Inc: [www.pilkington.com/na](http://www.pilkington.com/na).
  - 4. PPG Industries, Inc: [www.ppgglazing.com](http://www.ppgglazing.com).
- B. Float Glass: All glazing is to be float glass unless otherwise indicated.
  - 1. Annealed Type: ASTM C1036, Type I, transparent flat, Class 1 clear, Quality Q3 (glazing select).
  - 2. Heat-Strengthened and Fully Tempered Types: ASTM C1048.
  - 3. Tinted Types: Color and performance characteristics as indicated.
  - 4. Thicknesses: As indicated; for exterior glazing comply with specified requirements for wind load design regardless of specified thickness.
- C. Low E Glass : Float type, heat strengthened, clear.

##### 2.03 GLAZING COMPOUNDS

- A. Manufacturers:
  - 1. Bostik Inc: [www.bostik-us.com](http://www.bostik-us.com).
  - 2. Momentive Performance Materials, Inc (formerly GE Silicones): [www.momentive.com](http://www.momentive.com).
  - 3. Pecora Corporation: [www.pecora.com](http://www.pecora.com).
  - 4. BASF Construction Chemicals-Building Systems: [www.chemrex.com](http://www.chemrex.com).

## **2.04 GLAZING ACCESSORIES**

- A. Glazing Gaskets: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C 864 Option I;.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that openings for glazing are correctly sized and within tolerance.
- B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and ready to receive glazing.

### **3.02 PREPARATION**

- A. Clean contact surfaces with solvent and wipe dry.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Prime surfaces scheduled to receive sealant.
- D. Install sealants in accordance with ASTM C1193 and FGMA Sealant Manual.
- E. Install sealant in accordance with manufacturer's instructions.

**END OF SECTION**

**SECTION 09 21 16**  
**GYPSUM BOARD ASSEMBLIES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Performance criteria for gypsum board assemblies.
- B. Metal stud wall framing.
- C. Metal channel ceiling framing.
- D. Acoustic insulation.
- E. Cementitious backing board.
- F. Gypsum wallboard.
- G. Joint treatment and accessories.
- H. Textured finish system.

**1.02 REFERENCE STANDARDS**

- A. ANSI A108.11 - American National Standard for Interior Installation of Cementitious Backer Units; 1999 (R2005).
- B. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 1999 (R2005).
- C. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2002 (Reapproved 2007).
- D. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2009a.
- E. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2006.
- F. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2009a.
- G. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2008.
- H. 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; 2010.
- I. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2007.
- J. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2010a.
- K. ASTM C1280 - Standard Specification for Application of Gypsum Sheathing; 2009.
- L. ASTM C1288 - Standard Specification for Discrete Non-Asbestos Fiber-Cement Interior Substrate Sheets; 1999 (Reapproved 2010).
- M. ASTM C1325 - Standard Specification for Non-Asbestos Fiber-Mat Reinforced Cement Substrate Sheets; 2008b.
- N. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2009a.
- O. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2000 (Reapproved 2005).
- P. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009.
- Q. ASTM E413 - Classification for Rating Sound Insulation; 2010.
- R. GA-216 - Application and Finishing of Gypsum Board; Gypsum Association; 2010.

- S. ICC (IBC) - International Building Code; 2009.
- T. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

### **1.03 SUBMITTALS**

- A. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.
- B. Samples: Submit two samples of gypsum board finished with proposed texture application, 12 by 12 inches in size, illustrating finish color and texture.

### **1.04 QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in performing , with minimum three years of documented experience.

## **PART 2 PRODUCTS**

### **2.01 GYPSUM BOARD ASSEMBLIES**

- A. Provide completed assemblies complying with ASTM C840 and GA-216.
- B. Interior Partitions Indicated as Acoustic: Provide completed assemblies with the following characteristics:
  - 1. Acoustic Attenuation: STC of 45-49 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

### **2.02 METAL FRAMING MATERIALS**

- A. Manufacturers - Metal Framing, Connectors, and Accessories:
  - 1. Dietrich Metal Framing: [www.dietrichindustries.com](http://www.dietrichindustries.com).
  - 2. Marino: [www.marinoware.com](http://www.marinoware.com).
  - 3. Phillips Manufacturing Company: [www.phillipsmfg.com](http://www.phillipsmfg.com).
  - 4. The Steel Network, Inc: [www.SteelNetwork.com](http://www.SteelNetwork.com).
- B. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf.
  - 1. Studs: "C" shaped with flat or formed webs with knurled faces.
  - 2. Perforated studs are not acceptable.
  - 3. Runners: U shaped, sized to match studs.
  - 4. Ceiling Channels: C shaped.
  - 5. Furring: Hat-shaped sections, minimum depth of 7/8 inch.
- C. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.
- D. Partition Head To Structure Connections: Provide track fastened to structure with legs of sufficient length to accommodate deflection, for friction fit of studs cut short and fastened as indicated on drawings.

### **2.03 BOARD MATERIALS**

- A. Manufacturers - Gypsum-Based Board:
  - 1. American Gypsum: [www.americangypsum.com](http://www.americangypsum.com).
  - 2. CertainTeed Corporation: [www.certainteed.com](http://www.certainteed.com).
  - 3. Georgia-Pacific Gypsum LLC: [www.gp.com/gypsum](http://www.gp.com/gypsum).
  - 4. National Gypsum Company: [www.nationalgypsum.com](http://www.nationalgypsum.com).
  - 5. Temple-Inland Inc: [www.templeinland.com](http://www.templeinland.com).
  - 6. USG Corporation: [www.usg.com](http://www.usg.com).
- 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: 5/8 inch.

- c. Multi-Layer Assemblies: Thicknesses as indicated on drawings.
- 3. Paper-Faced Products:
  - a. American Gypsum; EagleRoc Regular Gypsum Wallboard and FireBloc Type X Gypsum Wallboard.
  - b. CertainTeed Corporation; ProRoc Brand Gypsum Board.
  - c. CertainTeed Corporation; ProRoc Brand Abuse Resistant Gypsum Board.
  - d. Georgia-Pacific Gypsum LLC; ToughRock Gypsum Wallboard.
  - e. National Gypsum Company; Gold Bond Brand Gypsum Wallboard.
  - f. Temple-Inland Inc; Gypsumboard and Gypsum Board Fire Resistant Panels Type X and Type TGC.
  - g. USG Corporation; Sheetrock Brand Gypsum Panels.
- 4. Mold-Resistant Paper-Faced Products:
  - a. American Gypsum; M-Bloc.
  - b. CertainTeed Corporation; ProRoc Brand Moisture & Mold Resistant Gypsum Board.
  - c. National Gypsum Company; Gold Bond Brand XP Gypsum Board.
  - d. National Gypsum Company; Gold Bond Hi-Abuse Brand XP Wallboard.
  - e. Temple-Inland Inc; ComfortGuard Mold Resistant Gypsum Board.
  - f. USG Corporation; Sheetrock Brand Mold Tough Gypsum Panels.
  - g. USG Corporation; Sheetrock Brand Mold Tough Gypsum Panels AR.
- 5. Glass-Mat-Faced Products:
  - a. Georgia-Pacific Gypsum LLC; DensArmor Plus.
  - b. Georgia-Pacific Gypsum LLC; DensArmor Plus Abuse Guard.
- C. Backing Board For Wet Areas: One of the following products:
  - 1. Application: Surfaces behind FRP in wet areas including toilet rooms.
  - 2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
  - 3. ANSI Cement-Based Board: Non-gypsum-based; aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces complying with ANSI A118.9 or ASTM C1325.
    - a. Thickness: 1/2 inch.
    - b. Products:
      - 1) Custom Building Products; Wonderboard.
      - 2) National Gypsum Company; PermaBase Brand Cement Board.
      - 3) National Gypsum Company; PermaBase Flex Brand Cement Board.
      - 4) USG Corporation; Durock Brand Cement Board.
  - 4. ASTM Cement-Based Board: Non-gypsum-based, cementitious board complying with ASTM C1288.
    - a. Thickness: 1/2 inch.
    - b. Products:
      - 1) James Hardie Building Products, Inc; Hardibacker Cement Board.
      - 2) Substitutions: See Section 01 60 00 - Product Requirements.
  - 5. Glass-Mat-Faced Board: Coated glass mat water-resistant gypsum backing panel as defined in ASTM C1178.
    - a. Standard Type: Thickness 1/2 inch.
    - b. Fire-Resistant Type: Type X core, thickness 5/8 inch.
    - c. Products:
      - 1) Georgia-Pacific Gypsum LLC; DensShield Tile Backer.
      - 2) National Gypsum Company; Gold Bond e2XP Tile Backer.
      - 3) Temple-Inland Inc; GreenGlass Tile Backer.
      - 4) Substitutions: See Section 01 60 00 - Product Requirements.

## 2.04 ACCESSORIES

- A. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness: 3 inches.
- B. Finishing Accessories: ASTM C1047, galvanized steel or rolled zinc, unless otherwise indicated.

1. Types: As detailed or required for finished appearance.
  2. Special Shapes: In addition to conventional cornerbead and control joints, provide U-bead at exposed panel edges.
  3. Manufacturers - Finishing Accessories:
    - a. Same manufacturer as framing materials.
    - b. Phillips Manufacturing Co: [www.phillipsmfg.com](http://www.phillipsmfg.com).
- C. Joint Materials: ASTM C475 and as recommended by gypsum board manufacturer for project conditions.
1. Tape: 2 inch wide, coated glass fiber tape for joints and corners, except as otherwise indicated.
  2. Tape: 2 inch wide, creased paper tape for joints and corners, except as otherwise indicated.
  3. Ready-mixed vinyl-based joint compound.
  4. Powder-type vinyl-based joint compound.
  5. Chemical hardening type compound.
- D. High Build Drywall Surfer: Vinyl acrylic latex-based coating for spray application, designed to take the place of skim coating and separate paint primer in achieving Level 5 finish.
- E. Textured Finish Materials: Latex- or Vinyl-based compound; plain.
- F. Screws for Attachment to Steel Members Less Than 0.03 inch In Thickness, to Wood Members, and to Gypsum Board: ASTM C1002; self-piercing tapping type.
- G. Screws for Attachment to Steel Members From 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws for application of gypsum board to loadbearing steel studs.
- H. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

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

### **3.02 FRAMING INSTALLATION**

- A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.
- B. Suspended Ceilings and Soffits: Space framing and furring members as indicated.
1. Level ceiling system to a tolerance of 1/1200.
  2. Laterally brace entire suspension system.
- C. Studs: Space studs as permitted by standard.
1. Extend partition framing to structure where indicated and to ceiling in other locations.
  2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
  3. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs with continuous bridging.
- D. Blocking: Install wood blocking for support of:
1. Framed openings.
  2. Wall mounted cabinets.
  3. Plumbing fixtures.
  4. Toilet partitions.
  5. Toilet accessories.
  6. Wall mounted door hardware.

### **3.03 ACOUSTIC ACCESSORIES INSTALLATION**

- A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

### **3.04 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. Single-Layer Non-Rated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
  - 1. Exception: Tapered edges to receive joint treatment at right angles to framing.
- C. Cementitious Backing Board: Install over steel framing members and plywood substrate where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.
- D. Installation on Metal Framing: Use screws for attachment of all gypsum board .
- E. Moisture Protection: Treat cut edges and holes in moisture resistant gypsum board with sealant.

### **3.05 INSTALLATION OF TRIM AND ACCESSORIES**

- A. Control Joints: Place control joints consistent with lines of building spaces and as follows:
  - 1. Not more than 30 feet apart on walls and ceilings over 50 feet long.
- B. Corner Beads: Install at external corners, using longest practical lengths.
- C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials and as indicated.

### **3.06 JOINT TREATMENT**

- A. Glass Mat Faced Gypsum Board and Exterior Glass Mat Faced Sheathing: Use fiberglass joint tape, bedded and finished with chemical hardening type joint compound.
- B. Paper Faced Gypsum Board: Use paper joint tape, bedded with ready-mixed vinyl-based joint compound and finished with ready-mixed vinyl-based joint compound.
- C. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
  - 1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
  - 2. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
- D. 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.
- E. Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

### **3.07 TEXTURE FINISH**

- A. Apply finish texture coating by means of spraying apparatus in accordance with manufacturer's instructions and to match approved sample.

### **3.08 TOLERANCES**

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

**END OF SECTION**



**SECTION 09 22 16**  
**NON-STRUCTURAL METAL FRAMING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Metal partition, ceiling, and soffit framing.
- B. Framing accessories.

**1.02 REFERENCE STANDARDS**

- A. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2009a.
- B. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2006.
- C. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2009a.
- D. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2007.
- E. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 2002 (Ed. 2004).

**1.03 SUBMITTALS**

- A. Product Data: Provide data describing framing member materials and finish, product criteria, load charts, and limitations.
- B. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.
- C. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

**1.04 QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in performing the work of this section with minimum three years experience.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Metal Framing, Connectors, and Accessories:
  - 1. Clarkwestern Dietrich Building Systems LLC: [www.clarkdeitrich.com](http://www.clarkdeitrich.com).
  - 2. Dietrich Metal Framing: [www.dietrichindustries.com](http://www.dietrichindustries.com).
  - 3. Marino: [www.marinoware.com](http://www.marinoware.com).
  - 4. The Steel Network, Inc: [www.SteelNetwork.com](http://www.SteelNetwork.com).

**2.02 FRAMING MATERIALS**

- A. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf.
  - 1. Studs: C shaped with flat or formed webs.
  - 2. Perforated studs are unacceptable.
  - 3. Runners: U shaped, sized to match studs.
  - 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 track fastened to structure with legs of sufficient length to accommodate deflection, for friction fit of studs cut short and fastened as indicated on drawings.

- D. Tracks and Runners: Same material and thickness as studs, bent leg retainer notched to receive studs with provision for crimp locking to stud.
- E. Furring and Bracing Members: Of same material as studs; thickness to suit purpose; complying with applicable requirements of ASTM C754.
- F. Fasteners: ASTM C1002 self-piercing tapping screws.
- G. Sheet Metal Backing: 0.036 inch thick, galvanized.
- H. Anchorage Devices: Power actuated.
- I. Acoustic Sealant: As specified in Section 09 21 16.
- J. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic.

### **2.03 FABRICATION**

- A. Fabricate assemblies of framed sections to sizes and profiles required.
- B. Fit, reinforce, and brace framing members to suit design requirements.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify that rough-in utilities are in proper location.

### **3.02 INSTALLATION OF STUD FRAMING**

- A. Comply with requirements of ASTM C754.
- B. Extend partition framing as indicated in Partition Schedule.
- C. 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. Align and secure top and bottom runners at 24 inches on center.
- E. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.
- F. Install studs vertically at 16 inches on center.
- G. Align stud web openings horizontally.
- H. Secure studs to tracks using crimping method. Do not weld.
- I. Stud splicing is not permissible.
- J. Fabricate corners using a minimum of three studs.
- K. Double stud at wall openings, door and window jambs, not more than 2 inches from each side of openings.
- L. Coordinate erection of studs with requirements of door frames; install supports and attachments.
- M. Coordinate installation of bucks, anchors, and blocking with electrical, mechanical, and other work to be placed within or behind stud framing.
- N. Blocking: Use wood blocking secured to studs. Provide blocking for support of plumbing fixtures, toilet partitions, wall cabinets, toilet accessories, and hardware.
- O. Use sheet metal backing for reinforcement of all other items requiring support.

### **3.03 CEILING AND SOFFIT FRAMING**

- A. Comply with requirements of ASTM C754.
- B. Install furring after work above ceiling or soffit is complete. Coordinate the location of hangers with other work.

- C. Install furring independent of walls, columns, and above-ceiling work.
- D. Securely anchor hangers to structural members or embed in structural slab. Space hangers as required to limit deflection to criteria indicated. Use rigid hangers at exterior soffits.
- E. Space main carrying channels at maximum 72 inch on center, and not more than 6 inches from wall surfaces. Lap splice securely.
- F. Securely fix carrying channels to hangers to prevent turning or twisting and to transmit full load to hangers.
- G. Place furring channels perpendicular to carrying channels, not more than 2 inches from perimeter walls, and rigidly secure. Lap splices securely.
- H. Reinforce openings in suspension system that interrupt main carrying channels or furring channels with lateral channel bracing. Extend bracing minimum 24 inches past each opening.
- I. Laterally brace suspension system.

#### **3.04 TOLERANCES**

- A. Maximum Variation From True Position: 1/8 inch in 10 feet.
- B. Maximum Variation From Plumb: 1/8 inch in 10 feet.

**END OF SECTION**



**SECTION 09 51 00**  
**ACOUSTICAL CEILINGS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Suspended metal grid ceiling system.
- B. Acoustical units.
- C. Supplementary acoustical insulation above ceiling.

**1.02 REFERENCE STANDARDS**

- A. ASTM C635 - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2007.
- B. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels; 2008.
- C. ASTM E 1264 - Standard Classification for Acoustical Ceiling Products; 1998 (Reapproved 2005).

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
- B. Do not install acoustical units until after interior wet work is dry.

**1.04 SUBMITTALS**

- A. Product Data: Provide data on suspension system components and acoustical units.
- B. Manufacturer's Installation Instructions: Indicate special procedures.
- C. Maintenance Materials: Furnish the following for New Barite Plant's use in maintenance of project.
  - 1. Extra Acoustical Units: Quantity equal to 5 percent of total installed.

**1.05 QUALITY ASSURANCE**

- A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

**1.06 FIELD CONDITIONS**

- A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

**PART 2 PRODUCTS**

**2.01 ACOUSTICAL UNITS**

- A. Manufacturers:
  - 1. USG; Product MARS Climaplus: [www.usg.com](http://www.usg.com).
  - 2. Substitutions: Not permitted without owner approval.
- B. Acoustical Units - General: ASTM E1264, Class A.
- C. Acoustical Panels:
  - 1. Size: 24 x 24 inches.
  - 2. Panel Edge: Square.
  - 3. Surface Color: White.

**2.02 SUSPENSION SYSTEM(S)**

- A. Manufacturers:

1. Same as for acoustical units.
- B. Suspension Systems - General: ASTM C 635; die cut and interlocking components, with stabilizer bars, clips, splices, perimeter moldings, and hold down clips as required.
- C. Exposed Steel Suspension System: Formed steel, commercial quality cold rolled; intermediate-duty.
  1. Profile: Tee; 9/16 inch wide face.
  2. Finish: White painted.
  3. Product: Centricitee by USG.

### **2.03 ACCESSORIES**

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application and ceiling system flatness requirement specified.
- B. Perimeter Moldings: Same material and finish as grid.
  1. At Exposed Grid: Provide L-shaped molding for mounting at same elevation as face of grid.
- C. Acoustical Insulation: Specified in Section 07 21 00.
- D. Touch-up Paint: Type and color to match acoustical and grid units.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify that layout of hangers will not interfere with other work.

### **3.02 INSTALLATION - SUSPENSION SYSTEM**

- A. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
- B. Locate system on room axis according to reflected plan.
- C. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.
- D. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
- E. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
- F. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
- G. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.
- H. Do not eccentrically load system or induce rotation of runners.
- I. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
  1. Use longest practical lengths.
  2. Overlap and rivet corners.

### **3.03 INSTALLATION - ACOUSTICAL UNITS**

- A. Install acoustical units in accordance with manufacturer's instructions.
- B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
- C. Fit border trim neatly against abutting surfaces.
- D. Install units after above-ceiling work is complete.
- E. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

- F. Cutting Acoustical Units:
  - 1. Cut to fit irregular grid and perimeter edge trim.
  - 2. Make field cut edges of same profile as factory edges.
  - 3. Double cut and field paint exposed reveal edges.
- G. Install hold-down clips on panels within 20 ft of an exterior door.

**3.04 TOLERANCES**

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

**END OF SECTION**



**SECTION 09 65 00  
RESILIENT FLOORING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Resilient tile flooring.
- B. Resilient base.
- C. Installation accessories.

**1.02 REFERENCE STANDARDS**

- A. ASTM E 648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2008.
- B. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2008.
- C. ASTM F1066 - Standard Specification for Vinyl Composition Floor Tile; 2004 (Reapproved 2010)e1.
- D. ASTM F 1861 - Standard Specification for Resilient Wall Base; 2002.

**1.03 SUBMITTALS**

- A. Concrete Testing Standard: Submit a copy of ASTM F710.
- B. Certification: Prior to installation of flooring, submit written certification by flooring manufacturer and adhesive manufacturer that condition of sub-floor is acceptable.
- C. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.
- D. Maintenance Materials: Furnish the following for use in maintenance of project.
  - 1. Extra Flooring Material: 100 square feet of each type and color.
  - 2. Extra Wall Base: 100 linear feet of each type and color.

**1.04 DELIVERY, STORAGE, AND HANDLING**

- A. Protect roll materials from damage by storing on end.

**1.05 FIELD CONDITIONS**

- A. Maintain temperature in storage area between 55 degrees F and 90 degrees F.
- B. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

**PART 2 PRODUCTS**

**2.01 TILE FLOORING**

- A. Vinyl Composition Tile: Homogeneous, with color extending throughout thickness, and:
  - 1. Minimum Requirements: Comply with ASTM F1066, of Class corresponding to type specified.
  - 2. Critical Radiant Flux (CRF): Minimum 0.45 watt per square centimeter, when tested in accordance with ASTM E 648.
  - 3. Size: 12 x 12 inch.
  - 4. Thickness: 0.125 inch.
  - 5. Pattern: Product as scheduled on Drawings.
  - 6. Manufacturers:
    - a. Armstrong World Industries, Inc: [www.armstrong.com](http://www.armstrong.com).
    - b. Provide equal as approved by owner.

## 2.02 RESILIENT BASE

- A. Resilient Base: ASTM F1861, Type TS rubber, vulcanized thermoset; top set Style B, Cove, and as follows:
  - 1. Height: 4 inch.
  - 2. Thickness: 0.125 inch thick.
  - 3. Finish: Satin.
  - 4. Length: 4 foot sections.
  - 5. Color: Product as scheduled on Drawings.
  - 6. Accessories: Premolded external corners, internal corners, and end stops.
  - 7. Manufacturers:
    - a. Armstrong World Industries, Inc.
    - b. Azrock Commercial Flooring, DOMCO
    - c. Burke Flooring: [www.burkemercer.com](http://www.burkemercer.com).
    - d. Johnsonite, Inc: [www.johnsonite.com](http://www.johnsonite.com).
    - e. Marley Flexco (USA), Inc.
    - f. Musson, R. C. Rubber Co.
    - g. Roppe Corp: [www.roppe.com](http://www.roppe.com).

## 2.03 ACCESSORIES

- A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.
- B. Primers, Adhesives, and Seaming Materials: Waterproof; types recommended by flooring manufacturer.
- C. Sealer and Wax: Types recommended by flooring manufacturer.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.
- C. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for resilient flooring installation by testing for moisture and pH.
  - 1. Test in accordance with ASTM F710.
  - 2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.
- D. Verify that concrete sub-floor surfaces are dry enough and ready for resilient flooring installation by testing for moisture emission rate and alkalinity in accordance with ASTM F710; obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.
- E. Verify that required floor-mounted utilities are in correct location.

### 3.02 PREPARATION

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- B. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.
- C. Prohibit traffic until filler is cured.
- D. Clean substrate.

### 3.03 INSTALLATION

- A. Starting installation constitutes acceptance of sub-floor conditions.
- B. Install in accordance with manufacturer's instructions.

- C. Spread only enough adhesive to permit installation of materials before initial set.
- D. Fit joints tightly.
- E. Set flooring in place, press with heavy roller to attain full adhesion.
- F. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.
- G. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
- H. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

#### **3.04 TILE FLOORING**

- A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless manufacturer's instructions say otherwise.
- B. Lay flooring with joints and seams parallel to building lines to produce symmetrical tile pattern.

#### **3.05 RESILIENT BASE**

- A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.
- B. Install base on solid backing. Bond tightly to wall and floor surfaces.
- C. Scribe and fit to door frames and other interruptions.

#### **3.06 CLEANING**

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean in accordance with manufacturer's instructions.

#### **3.07 PROTECTION**

- A. Prohibit traffic on resilient flooring for 48 hours after installation.

**END OF SECTION**



**SECTION 09 90 00**  
**PAINTING AND COATING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Surface preparation.
- B. Field application of paints and other coatings.
- C. Scope: Finish all interior and exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
  - 1. Both sides and edges of plywood backboards for electrical and telecom equipment before installing equipment.
  - 2. Exposed surfaces of steel lintels and ledge angles.
  - 3. Surfaces inside cabinets.
- D. Do Not Paint or Finish the Following Items:
  - 1. Items fully factory-finished unless specifically so indicated; materials and products having factory-applied primers are not considered factory finished.
  - 2. Items indicated to receive other finishes.
  - 3. Items indicated to remain unfinished.
  - 4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
  - 5. Non-metallic roofing and flashing.
  - 6. Stainless steel, anodized aluminum, bronze, terne, and lead items.
  - 7. Marble, granite, slate, and other natural stones.
  - 8. Floors, unless specifically so indicated.
  - 9. Ceramic and other tiles.
  - 10. Glass.
  - 11. Acoustical materials, unless specifically so indicated.
  - 12. Concealed pipes, ducts, and conduits.

**1.02 DEFINITIONS**

- A. Conform to ASTM D16 for interpretation of terms used in this section.

**1.03 REFERENCE STANDARDS**

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.
- B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2011.
- C. ASTM D 4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials; 1992 (Reapproved 2003).

**1.04 SUBMITTALS**

- A. Product Data: Provide data on all finishing products, including VOC content.
- B. Samples: Submit two paper chip samples, 12" x 12" inch in size illustrating range of colors and textures available for each surface finishing product scheduled.
- C. Manufacturer's Instructions: Indicate special surface preparation procedures.
- D. Maintenance Data: Submit data on cleaning, touch-up, and repair of painted and coated surfaces.
- E. Maintenance Materials: Furnish the following for New Barite Plant's use in maintenance of project.
  - 1. Extra Paint and Coatings: 1 gallon of each color; store where directed.
  - 2. Label each container with color in addition to the manufacturer's label.

## 1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years experience.

## 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

## 1.07 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.
- D. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

## PART 2 PRODUCTS

### 2.01 MANUFACTURERS

- A. Provide all paint and coating products from the same manufacturer to the greatest extent possible.

### 2.02 PAINTS AND COATINGS - GENERAL

- A. Paints and Coatings: Ready mixed, unless intended to be a field-catalyzed coating.
  - 1. Provide paints and coatings of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
  - 2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
  - 3. Supply each coating material in quantity required to complete entire project's work from a single production run.
  - 4. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.
- B. Primers: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.
- C. Volatile Organic Compound (VOC) Content:
  - 1. Provide coatings that comply with the most stringent requirements specified in the following:
    - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
  - 2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
- D. Chemical Content: The following compounds are prohibited:
  - 1. Aromatic Compounds: In excess of 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).

- 2. Acrolein, acrylonitrile, antimony, benzene, butyl benzyl phthalate, cadmium, di (2-ethylhexyl) phthalate, di-n-butyl phthalate, di-n-octyl phthalate, 1,2-dichlorobenzene, diethyl phthalate, dimethyl phthalate, ethylbenzene, formaldehyde, hexavalent chromium, isophorone, lead, mercury, methyl ethyl ketone, methyl isobutyl ketone, methylene chloride, naphthalene, toluene (methylbenzene), 1,1,1-trichloroethane, vinyl chloride.
- E. Flammability: Comply with applicable code for surface burning characteristics.
- F. Colors: As indicated on drawings

### **2.03 PAINT SYSTEMS - EXTERIOR**

- A. Ferrous Metals, Primed, Alkyd, 2 Coat:
  - 1. Touch-up with rust-inhibitive primer recommended by top coat manufacturer.
  - 2. Semi-gloss: Two coats of alkyd enamel.
- B. Galvanized Metals, Alkyd, 3 Coat:
  - 1. One coat galvanize primer.
  - 2. Semi-gloss: Two coats of alkyd enamel.

### **2.04 PAINT SYSTEMS - INTERIOR**

- A. Wood, Opaque, Latex, 2 Coat:
  - 1. One coat of latex primer sealer.
  - 2. Semi-gloss: One coat of latex enamel.
  - 3. Eggshell: One coat of latex enamel.
- B. Ferrous Metals, Primed, Latex, 2 Coat:
  - 1. Touch-up with latex primer.
  - 2. Semi-gloss: Two coats of latex enamel.
- C. Paint CI-OP-3E - Concrete/Masonry, Epoxy Enamel, 3 Coat:
  - 1. One coat of catalyzed epoxy primer.
  - 2. Gloss: Two coats of catalyzed epoxy enamel.
- D. Gypsum Board/Plaster, Latex-Acrylic, 3 Coat:
  - 1. One coat of alkyd primer sealer.
  - 2. Eggshell: Two coats of latex-acrylic enamel.

### **2.05 ACCESSORY MATERIALS**

- A. Accessory Materials: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required to achieve the finishes specified whether specifically indicated or not; commercial quality.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Do not begin application of coatings until substrates have been properly prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- D. If substrate preparation is the responsibility of another installer, notify General Contractor of unsatisfactory preparation before proceeding.
- E. Test shop-applied primer for compatibility with subsequent cover materials.
- F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
  - 1. Gypsum Wallboard: 12 percent.
  - 2. Interior Wood: 15 percent, measured in accordance with ASTM D4442.
  - 3. Concrete Floors and Traffic Surfaces: 8 percent.

### **3.02 PREPARATION**

- A. Clean surfaces thoroughly and correct defects prior to coating application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- D. Seal surfaces that might cause bleed through or staining of topcoat.
- E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- F. Gypsum Board Surfaces to be Painted: Fill minor defects with filler compound. Spot prime defects after repair.
- G. Concrete Floors and Traffic Surfaces to be Painted: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.
- H. Interior Wood Surfaces to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats. Prime concealed surfaces with gloss varnish reduced 25 percent with thinner.
- I. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with clear sealer.
- J. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

### **3.03 APPLICATION**

- A. Apply products in accordance with manufacturer's instructions.
- B. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.
- C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- D. Apply each coat to uniform appearance.
- E. Sand wood and metal surfaces lightly between coats to achieve required finish.
- F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- G. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.
- H. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

### **3.04 CLEANING**

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

### **3.05 PROTECTION**

- A. Protect finished coatings until completion of project.
- B. Touch-up damaged coatings after Substantial Completion.

**END OF SECTION**

**SECTION 09 97 10**  
**FIBERGLASS REINFORCED PANELS**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Provide fiberglass reinforced panels and accessories as specified herein, and as needed for a complete and proper installation.

**1.02 SUBMITTALS**

- A. Product Data: Submit manufacturer's technical data and installation instructions.

**1.03 QUALITY ASSURANCE**

- A. Use of adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for performance of the Work of this Section.

**1.04 DELIVERY, STORAGE, AND HANDLING**

- A. Comply with the recommendations and instructions of the Manufacturer.

**PART 2 - PRODUCTS**

**2.01 WALL PANELS**

- A. Where scheduled on Drawings, provide "Glasbord-FSI" fiberglass reinforced panels as manufactured by Crane Composites, or an approved equal.
  1. Size: 4'-0" by 8'-0" (1.2 m by 2.44 m).
  2. Sheet Thickness: 0.75-inches (1.9 mm).
  3. Fire Rating: Class A in accordance with ASTM E84.
  4. Color: White.
  5. Finish Texture: Smooth Gloss.

**2.02 MISCELLANEOUS MATERIALS**

- A. Trim: Rigid PVC trim, in color matching respective wall panels, as supplied by panel manufacturer for outside/inside corners, vertical joints, openings, outside angles, end caps, and ceiling intersections.
- B. Fasteners: Nylon panhead rivets.
- C. Adhesive: Equal to solvent-free FRP 4054 or as recommended by manufacturer.
- D. Sealant: Equal to silicone 2601 or as recommended by manufacturer.
- E. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor, subject to the approval of the Architect.

**PART 3 - EXECUTION**

**3.01 SURFACE CONDITIONS**

- A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

**3.02 INSTALLATION**

- A. Installation of panels shall be in strict accordance with the manufacturer's recommendations and instructions.
- B. Promptly, upon completion of installation, clean all exposed surfaces with methods and materials recommended by the manufacturer of the panels.

**END OF SECTION**



## SECTION 10 14 00

### SIGNAGE

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Room and door signs.
- B. Interior directional and informational signs.
- C. Emergency evacuation maps.
- D. Building identification signs.

##### 1.02 REFERENCE STANDARDS

- A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2003.
- B. ATBCB ADAAG - Americans with Disabilities Act Accessibility Guidelines; 2002.

##### 1.03 SUBMITTALS

- A. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.
- B. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
  - 1. When room numbers to appear on signs differ from those on the drawings, include the drawing room number on schedule.
  - 2. When content of signs is indicated to be determined later, request such information from New Barite Plant through Multatech Architects Engineers at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
  - 3. Submit for approval by New Barite Plant through General Contractor prior to fabrication.
- C. Samples: Submit two samples of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.
- D. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.
- E. Verification Samples: Submit samples showing colors specified.
- F. Manufacturer's Installation Instructions: Include installation templates and attachment devices.
- G. Maintenance Materials: Furnish the following for New Barite Plant's use in maintenance of project.

##### 1.04 DELIVERY, STORAGE, AND HANDLING

- A. Package signs as required to prevent damage before installation.
- B. Package room and door signs in sequential order of installation, labeled by floor or building.
- C. Store tape adhesive at normal room temperature.

##### 1.05 FIELD CONDITIONS

- A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.
- B. Maintain this minimum temperature during and after installation of signs.

#### PART 2 PRODUCTS

##### 2.01 MANUFACTURERS

- A. Flat Signs:
  - 1. APCO graphics, Inc.
  - 2. ASI-Modulex, Inc.
  - 3. Best Sign Systems, Inc: [www.bestsigns.com](http://www.bestsigns.com).

4. Mohawk Sign Systems, Inc: [www.mohawksign.com](http://www.mohawksign.com).
5. Nelson-Harkins Industries
6. Seton Identification Products: [www.seton.com/aec](http://www.seton.com/aec).
7. The Supersine Comapny

## 2.02 SIGNAGE APPLICATIONS

- A. Accessibility Compliance: All signs are required to comply with ADAAG and ANSI/ICC A 117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.
- B. All Signage Types: Unless otherwise indicated:
  1. Character Font: Helvetica, Arial, or other sans serif font.
  2. Character Case: Upper and lower case (title case).
  3. Background Color: White.
  4. Character Color: Halliburton Red color.
- C. Room and Door Signs: Provide a sign for every doorway, whether it has a door or not, not including corridors, lobbies, and similar open areas.
  1. Sign Type: Flat signs with engraved panel media as specified.
  2. Provide "tactile" signage, with letters raised minimum 1/32 inch and Grade II braille.
  3. Use engraved panel signs as specified.
  4. Character Height: 1 inch.
  5. Sign Height: 2 inches, unless otherwise indicated.
  6. Office Doors: Identify with room numbers to be determined later, not the numbers shown on the drawings ; in addition, provide "window" section for replaceable occupant name.
  7. Conference and Meeting Rooms: Identify with room numbers to be determined later, not the numbers shown on the drawings ; in addition, provide "window" section with sliding "In Use/Vacant" indicator.
  8. Service Rooms: Identify with room names and numbers to be determined later, not those shown on the drawings.
  9. Rest Rooms: Identify with pictograms, the names "MEN" and "WOMEN", room numbers to be determined later, and braille.
- D. Interior Directional and Informational Signs:
  1. Sign Type: Same as room and door signs.
  2. Allow for 20 signs 4 inches high by 16 inches long.
- E. Emergency Evacuation Maps:
  1. Use clear plastic panel silk-screened on reverse, in brushed aluminum frame, screw-mounted.
- F. Building Identification Signs:
  1. Use individual metal letters.
  2. Requirement for building identification to be determined by local authority.
  3. Mount on outside wall in location to be determined by local authority.

## 2.03 SIGN TYPES

- A. Flat Signs: Signage media without frame.
  1. Edges: Square.
  2. Corners: Square.
  3. Wall Mounting of One-Sided Signs: Tape adhesive.
- B. Color and Font: Unless otherwise indicated:
  1. Character Font: Helvetica, Arial, or other sans serif font.
  2. Character Case: Upper case only.
  3. Background Color: Clear.
  4. Character Color: Contrasting color.

## **2.04 TACTILE SIGNAGE MEDIA**

- A. Engraved Panels: Laminated colored plastic; engraved through face to expose core as background color:
  - 1. Total Thickness: 1/16 inch.
  - 2. Panel Edges: Square.
  - 3. Panel Corners: Square.
  - 4. Mounting: Tape adhesive.

## **2.05 ACCESSORIES**

- A. Tape Adhesive: Double sided tape, permanent adhesive.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

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

### **3.02 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install neatly, with horizontal edges level.
- C. Locate signs where indicated:
  - 1. Room and Door Signs: Locate on wall at latch side of door with centerline of sign at 60 inches above finished floor.
  - 2. If no location is indicated obtain New Barite Plant's/Architect's instructions.
- D. Protect from damage until Substantial Completion; repair or replace damage items.

**END OF SECTION**



**SECTION 10 21 13.13**  
**METAL TOILET COMPARTMENTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Metal toilet compartments.
- B. Urinal and Vestibule screens.

**1.02 REFERENCE STANDARDS**

- A. ASTM A424 - Standard Specification for Steel, Sheet, for Porcelain Enameling; 2009a.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2010.
- C. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2010.

**1.03 ADMINISTRATIVE REQUIREMENTS**

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

**1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.
- C. Product Data: Provide data on panel construction, hardware, and accessories.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Metal Toilet Compartments:
  - 1. General Partitions Mfg. Corp: [www.generalpartitions.com](http://www.generalpartitions.com).
  - 2. Global Steel Products Corp: [www.globalpartitions.com](http://www.globalpartitions.com).
  - 3. Metpar Corp: [www.metpar.com](http://www.metpar.com).
  - 4. Sanymetal, A Crane Plumbing Company: [www.sanymetal.com](http://www.sanymetal.com).
  - 5. Substitutions: Section 01 60 00 - Product Requirements.

**2.02 MATERIALS**

- A. Stainless Steel Sheet: ASTM A666, Type 304.

**2.03 COMPONENTS**

- A. Toilet Compartments: Stainless steel, floor-mounted headrail-braced.
- B. Doors, Panels, and Pilasters: Sheet steel faces, pressure bonded to sound deadening core, formed and closed edges; corners made with corner clips or mitered, welded, and ground smooth.
  - 1. Panel Faces: 20 gage.
  - 2. Door Faces: 22 gage.
  - 3. Pilaster Faces: 20 gage.
  - 4. Reinforcement: 12 gage.
  - 5. Internal Reinforcement: Provide in areas of attached hardware and fittings. Mark locations of reinforcement for partition mounted washroom accessories.
- C. Door and Panel Dimensions:
  - 1. Thickness: 1 inch.
  - 2. Door Width: 24 inch.
  - 3. Door Width for Handicapped Use: 36 inch .
  - 4. Height: 58 inch.

- D. Pilasters: 1-1/4 inch thick, of sizes required to suit compartment width and spacing.
- E. Urinal Screens: Wall mounted with two panel brackets, and floor-to-ceiling vertical upright consisting of tubular headrail stock and sockets anchored to floor and ceiling.
- F. Urinal Screen Splash Panels: Stainless steel sheet 30 inch wide x 42 inch high mounted on partitions adjacent to urinals. Fasten with stainless steel screws spaced 8 inches on center.

#### **2.04 ACCESSORIES**

- A. Pilaster Shoes: Formed chromed steel with polished finish, 3 inch high, concealing floor fastenings.
  - 1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.
  - 2. Provide ceiling attachment using two adjustable hanging studs, attached to above-ceiling framing.
- B. Head Rails: Hollow chrome-plated steel tube, 1 x 1-5/8 inch size, with anti-grip strips and cast socket wall brackets.
- C. Brackets: Polished chrome-plated non-ferrous cast metal.
- D. Attachments, Screws, and Bolts: Stainless steel, tamper proof type.
  - 1. For attaching panels and pilasters to brackets: Through-bolts and nuts; tamper proof.
- E. Hardware: Polished stainless steel:
  - 1. Pivot hinges, gravity type, adjustable for door close positioning; two per door.
  - 2. Thumb turn or sliding 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. Refer Fixture Schedule
  - 5. Provide door pull for outswinging doors.

#### **2.05 FINISHING**

- A. Stainless Steel Compartments: No. 4 finish.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify that field measurements are as indicated.
- C. Verify correct spacing of and between plumbing fixtures.
- D. Verify correct location of built-in framing, anchorage, and bracing.

#### **3.02 INSTALLATION**

- A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.
- B. Maintain 3/8 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.

#### **3.03 TOLERANCES**

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

#### **3.04 ADJUSTING**

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

C. Adjust adjacent components for consistency of line or plane.

**END OF SECTION**



**SECTION 10 21 13.19**  
**PLASTIC TOILET COMPARTMENTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Solid plastic toilet compartments.
- B. Urinal and Vestibule screens.

**1.02 REFERENCE STANDARDS**

- A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2010.

**1.03 ADMINISTRATIVE REQUIREMENTS**

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

**1.04 SUBMITTALS**

- A. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.
- B. Product Data: Provide data on panel construction, hardware, and accessories.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Plastic Toilet Compartments:
  - 1. Ampco Products, Inc: [www.ampco.com](http://www.ampco.com).
  - 2. Metpar Corp: [www.metpar.com](http://www.metpar.com).
  - 3. Provide equal to products listed.

**2.02 COMPONENTS**

- A. Toilet Compartments: Solid molded high density polyethylene (HDPE) plastic panels, doors, and pilasters, floor-to-ceiling.
  - 1. Color: Verify with owner.
- B. 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.
  - 5. Thickness of Pilasters: 1 inch.
- C. Urinal Screens: Wall mounted with two panel brackets, and floor-to-ceiling vertical upright consisting of pilaster anchored to floor and ceiling.

**2.03 ACCESSORIES**

- A. Pilaster Shoes: Formed chromed steel with polished finish, 3 in high, concealing floor fastenings.
  - 1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.
  - 2. Provide ceiling attachment using two adjustable hanging studs, attached to above-ceiling framing.
- B. Pilaster Brackets: Polished stainless steel.
- C. Wall Brackets: Continuous type, polished stainless steel.
- D. Attachments, Screws, and Bolts: Stainless steel , tamper proof type.
  - 1. For attaching panels and pilasters to brackets: Through-bolts and nuts ; tamper proof.
- E. Hardware: Polished stainless steel:
  - 1. Pivot hinges, gravity type, adjustable for door close positioning; two per door.

2. Door Latch: Slide type 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**

#### **3.01 EXAMINATION**

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

#### **3.02 INSTALLATION**

- A. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.
- B. Maintain 3/8 to 1/2 inch space between wall and panels and between wall and end pilasters.
- C. Attach panel brackets securely to walls using anchor devices.
- D. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.
- E. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

#### **3.03 TOLERANCES**

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

#### **3.04 ADJUSTING**

- A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.
- B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.
- C. Adjust adjacent components for consistency of line or plane.

**END OF SECTION**

**SECTION 10 26 01**  
**WALL AND CORNER GUARDS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Corner guards.

**1.02 REFERENCE STANDARDS**

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2010b.
- B. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2011.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Wall and Corner Guards:
  - 1. CS Group Construction Specialties, Inc; Product Acrovyn type SM-20: [www.c-sgroup.com](http://www.c-sgroup.com).
  - 2. Provide equal to product listed.

**2.02 COMPONENTS**

- A. Corner Guards - Surface Mounted: High impact vinyl/acrylic with integral color.
  - 1. Size: 3 inches.
  - 2. Corner: Square.
  - 3. Color: Match wall color.
  - 4. Length: 48"
  - 5. Preformed end caps.
  - 6. Provide at all exposed gypsum board outside corners including door jambs.

**2.03 FABRICATION**

- A. Fabricate components with tight joints, corners and seams.
- B. Pre-drill holes for attachment.
- C. Form end trim closure by capping and finishing smooth.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify that rough openings, concealed blocking, and anchors are correctly sized and located.

**3.02 INSTALLATION**

- A. Install components in accordance with manufacturer's instructions, level and plumb, secured rigidly in position to wall framing members only.

**3.03 TOLERANCES**

- A. Maximum Variation From Required Height: 1/4 inch.
- B. Maximum Variation From Level or Plane For Visible Length: 1/4 inch.

**END OF SECTION**



**SECTION 10 28 00**  
**TOILET AND BATH ACCESSORIES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Accessories for toilet rooms, showers, and utility rooms.
- B. Grab bars.

**1.02 REFERENCE STANDARDS**

- A. ASTM A167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip; 1999 (Reapproved 2009).
- B. ASTM A 269 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2007a.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2010.
- D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2010.
- E. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium; 2003 (Reapproved 2009).
- F. ASTM C1036 - Standard Specification for Flat Glass; 2006.
- G. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2008.
- H. ASTM F2285 - Standard Consumer Safety Performance Specification for Diaper Changing Tables for Commercial Use; 2004 (Reapproved 2010).

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

**1.04 SUBMITTALS**

- A. Product Data: Provide data on accessories describing size, finish, details of function, attachment methods.
- B. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Products listed are made by Bobrick.
- B. Other Acceptable Manufacturers:
  - 1. Provide equal to basis of design products.
- C. All items of each type to be made by the same manufacturer.

**2.02 MATERIALS**

- A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
- B. Keys: Provide 2 keys for each accessory; master key all lockable accessories.
- C. Stainless Steel Sheet: ASTM A666, Type 304.
- D. Stainless Steel Tubing: ASTM A269, Type 304 or 316.
- E. Galvanized Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.
- F. Mirror Glass: Float glass, ASTM C1036 Type I, Class 1, Quality Q2, with silvering, protective and physical characteristics complying with ASTM C1503.

- G. Fasteners, Screws, and Bolts: Hot dip galvanized, tamper-proof , security type.
- H. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

### **2.03 FINISHES**

- A. Chrome/Nickel Plating: ASTM B456, satin finish, unless otherwise noted.
- B. Baked Enamel: Pretreat to clean condition, apply one coat primer and minimum two coats epoxy baked enamel.

### **2.04 TOILET ROOM ACCESSORIES**

- A. Refer to drawings for toilet room accessory information.
- B. Toilet Paper Dispenser "N": Single roll, surface mounted bracket type.
  - 1. Product: B-2740 manufactured by Bobrick.
- C. Combination Towel Dispenser/Waste Receptacle "E": Recessed, stainless steel; seamless wall flanges, continuous piano hinges, tumbler locks on upper and lower doors.
  - 1. Waste receptacle liner: Reusable, heavy-duty vinyl.
  - 2. Towel dispenser capacity: 600 C-fold or 800 multi-fold.
  - 3. Waste receptacle capacity: 12 gallons.
  - 4. Product: B-3944 manufactured by Bobrick.
- D. Soap Dispenser "O": dispenser, wall-mounted, surface, with stainless steel cover and horizontal stainless steel tank and working parts; push type soap valve and check valve .
  - 1. Minimum Capacity: 40 ounces.
  - 2. Product: B-2111 manufactured by Bobrick.
- E. Mirrors "F" and "F1": Stainless steel framed, 6 mm thick mirror.
  - 1. Size: 24" x 36" and 18" x 54".
  - 2. Frame: 0.05 inch angle shapes, with mitered and welded and ground corners, and tamperproof hanging system; No.4 finish.
  - 3. Backing: Full-mirror sized, minimum 0.03 inch galvanized steel sheet and nonabsorptive filler material.
  - 4. Product "F": B-165 2436 manufactured by Bobrick.
  - 5. Product "F1": Custom
- F. Grab Bars "K": Stainless steel, outside diameter, minimum 0.05 inch wall thickness, nonslip grasping surface finish, concealed flange mounting; 1-1/2 inches clearance between wall and inside of grab bar.
  - 1. Length and configuration: As indicated on drawings.
  - 2. Product: B-5837 manufactured by Bobrick.
- G. Sanitary Napkin Disposal Unit "G": surface-mounted, self-closing door, locking bottom panel with full-length stainless steel piano-type hinge, removable receptacle.
  - 1. Product: B-270 manufactured by Bobrick.
- H. Garment Hook "M" and "L": Wall-mounted.
  - 1. Product: B-212 manufactured by Bobrick.

### **2.05 SHOWER AND TUB ACCESSORIES**

- A. Folding Shower Seat "R": Wall-mounted; welded tubular seat frame, structural support members, hinges and mechanical fasteners of Type 304 stainless steel, reversible seat.
  - 1. Seat: Phenolic or polymeric composite one-piece seat or seat slats, of white color.
  - 2. Product: B-5181 manufactured by Bobrick.
- B. Wall-Mounted Soap Dish "H": duty, seamless stainless steel, surface-mounted with drain holes, without grab bar, satin finish; with concealed mechanical fastening suitable for substrate and backplate.
  - 1. Product: B-680 manufactured by Bobrick.

- C. Towel Bar S": Stainless steel Type 304, square tubular bar; Round brackets, concealed attachment, satin finish.
  - 1. Length: 18 inches.
  - 2. Product: B-530 x 18 manufactured by Bobrick.

## **2.06 UTILITY ROOM ACCESSORIES**

- A. Combination Utility Shelf/Mop and Broom Holder "C": thick stainless steel, Type 304, with 1/2 inch returned edges, 0.06 inch steel wall brackets.
  - 1. Product: B-224 manufactured by Bobrick.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify exact location of accessories for installation.
- C. Verify that field measurements are as indicated on drawings.
- D. See Section 06100 for installation of blocking, reinforcing plates, and concealed anchors in walls.

### **3.02 PREPARATION**

- A. Deliver inserts and rough-in frames to site for timely installation.
- B. Provide templates and rough-in measurements as required.

### **3.03 INSTALLATION**

- A. Install accessories in accordance with manufacturers' instructions.
- B. Install plumb and level, securely and rigidly anchored to substrate.
- C. Mounting Heights and Locations: As required by accessibility regulations and as indicated on drawings

**END OF SECTION**



**SECTION 10 44 00**  
**FIRE PROTECTION SPECIALTIES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Fire extinguishers.
- B. Fire extinguisher cabinets.
- C. Accessories.

**1.02 REFERENCE STANDARDS**

- A. NFPA 10 - Standard for Portable Fire Extinguishers; 2010.

**1.03 SUBMITTALS**

- A. Shop Drawings: Indicate cabinet physical dimensions.
- B. Product Data: Provide extinguisher operational features.
- C. Manufacturer's Installation Instructions: Indicate special criteria and wall opening coordination requirements.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.

**1.04 FIELD CONDITIONS**

- A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

**PART 2 PRODUCTS**

**2.01 FIRE EXTINGUISHERS**

- A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
- B. Dry Chemical Type Fire Extinguishers: Cast steel tank, with pressure gage.

**2.02 FIRE EXTINGUISHER CABINETS**

- A. Metal: Formed primed steel sheet; 0.036 inch thick base metal.
- B. Cabinet Configuration: Surface and semi-recessed type.
  - 1. Sized to accommodate accessories.
  - 2. Form cabinet enclosure with right angle inside corners and seams. Form perimeter trim and door stiles.
- C. Door Glazing: Glass, clear, 1/8 inch thick float. Set in resilient channel gasket glazing.
- D. Door Glazing: Plastic, clear, 1/8 inch thick acrylic. Set in resilient channel gasket glazing.
- E. Cabinet Mounting Hardware: Appropriate to cabinet. Pre-drill for anchors.
- F. Weld, fill, and grind components smooth.
- G. Finish of Cabinet Exterior Trim and Door: Red enamel.
- H. Finish of Cabinet Interior: White enamel.

**2.03 ACCESSORIES**

- A. Graphic Identification: As required by local code and Fire Marshall.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify existing conditions before starting work.
- B. Verify rough openings for cabinet are correctly sized and located.

### **3.02 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install cabinets plumb and level in wall openings, 32 inches from finished floor to inside bottom of cabinet.
- C. Secure rigidly in place.
- D. Place extinguishers in cabinets.
- E. Position cabinet signage at locations directed by Fire Marshall.

**END OF SECTION**

**SECTION 12 21 13**  
**HORIZONTAL LOUVER BLINDS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Horizontal slat louver blinds.
- B. Operating hardware.

**1.02 REFERENCE STANDARDS**

- A. WCMA A100.1 - Safety of Corded Window Covering Products; Window Covering Manufacturers Association; 2010. (ANSI/WCMA A101.1)

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordinate the placement of concealed blocking to support blinds.

**1.04 SUBMITTALS**

- A. Product Data: Provide data indicating physical and dimensional characteristics.

**PART 2 PRODUCTS**

**2.01 BLINDS AND BLIND COMPONENTS**

- A. Blinds: Horizontal slat louvers hung from full-width headrail with full-width bottom rail; manual control of raising and lowering by cord with full range locking; blade angle adjustable by control wand; complying with WCMA A100.1.
- B. Metal Slats: Spring tempered pre-finished aluminum; radiused slat corners, with manufacturing burrs removed.
  - 1. Width: 1 inch.
  - 2. Color: White.
- C. Slat Support: Woven polypropylene cord, ladder configuration.
- D. Head Rail: Pre-finished, formed aluminum box, with end caps; internally fitted with hardware, pulleys, and bearings for operation; same depth as width of slats
- E. Bottom Rail: Pre-finished, formed steel with top side shaped to match slat curvature; with end caps. Color: Same as headrail.
- F. Lift Cord: Braided nylon; continuous loop.
- G. Control Wand: Extruded hollow plastic; hexagonal shape.
- H. Headrail Attachment: Wall brackets.
- I. Accessory Hardware: Type recommended by blind manufacturer.

**2.02 FABRICATION**

- A. Determine sizes by field measurement.
- B. Fabricate blinds to cover window frames completely.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify that openings are ready to receive the work.
- B. Ensure structural blocking and supports are correctly placed.

**3.02 INSTALLATION**

- A. Install blinds in accordance with manufacturer's instructions.
- B. Secure in place with flush countersunk fasteners.

**3.03 INSTALLATION TOLERANCES**

- A. Maximum Variation of Gap at Window Opening Perimeter: 1/4 inch.

B. Maximum Offset From Level: 1/8 inch.

**3.04 ADJUSTING**

A. Adjust blinds for smooth operation.

**3.05 CLEANING**

A. Clean blind surfaces just prior to occupancy.

**END OF SECTION**

**SECTION 13 34 19**  
**METAL BUILDING SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Manufacturer-engineered, shop-fabricated structural steel building frame.
- B. Metal wall and roof panels including soffits and gutters and downspouts.
- C. Exterior louvers.
- D. Insulation

**1.02 REFERENCE STANDARDS**

- A. AISC 360 - Specification for Structural Steel Buildings; American Institute of Steel Construction, Inc.; 2005.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.
- C. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength; 2010.
- D. ASTM A 325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2007a.
- E. ASTM A 325M - Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Tensile Strength (Metric); 2007.
- F. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2007.
- G. ASTM A529/A529M - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality; 2005 (Reapproved 2009).
- H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2010.
- I. ASTM A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process; 2010.
- J. ASTM C991 - Standard Specification for Flexible Glass Fiber Insulation for Metal Buildings; 2008e1.
- K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2010b.
- L. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society; 2007.
- M. AWS D1.1/D1.1M - Structural Welding Code - Steel; American Welding Society; 2006 and Errata.
- N. MBMA (LR) - Low Rise Building Systems Manual; Metal Building Manufacturers Association; 2006.
- O. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings; 2002 (Ed. 2004).
- P. UL 580 - Standard for Tests for Uplift Resistance of Roof Assemblies; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

**1.03 DESIGN REQUIREMENTS**

- A. Calculated Thermal Resistance of Wall System: R-19.
- B. Calculated Thermal Resistance of Roof System: R-19.
- C. Design members to withstand dead load, applicable snow load, and design loads due to pressure and suction of wind calculated in accordance with applicable code.

- D. Design members to withstand UL 580 Uplift Class 90.
- E. Exterior wall and roof system shall withstand imposed loads with maximum allowable deflection of 1/180 of span.
- F. Permit movement of components without buckling, failure of joint seals, undue stress on fasteners or other detrimental effects, when subject to temperature range of 120 degrees F.
- G. Size and fabricate wall and roof systems free of distortion or defects detrimental to appearance or performance.

#### **1.04 SUBMITTALS**

- A. Product Data: Provide data on profiles, component dimensions, fasteners.
- B. Shop Drawings: Indicate assembly dimensions, locations of structural members, connections; wall and roof system dimensions, panel layout, general construction details, anchorages and method of anchorage, installation ; framing anchor bolt settings, sizes, and locations from datum, foundation loads; indicate welded connections with AWS A2.4 welding symbols; indicate net weld lengths; provide professional seal and signature.
- C. Manufacturer's Instructions: Indicate preparation requirements, anchor bolt placement .
- D. Erection Drawings: Indicate members by label, assembly sequence, and temporary erection bracing.

#### **1.05 QUALITY ASSURANCE**

- A. Design structural components, develop shop drawings, and perform shop and site work under direct supervision of a Professional Structural Engineer experienced in design of this Work.
  - 1. Design Engineer Qualifications: Licensed in Gardendale, Texas.
  - 2. Conform to applicable code for submission of design calculations as required for acquiring permits.
  - 3. Cooperate with regulatory agency or authority and provide data as requested.
- B. Perform work in accordance with AISC 360 - Specification for Structural Steel Buildings.
- C. Perform welding in accordance with AWS D1.1.
- D. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- E. Erector Qualifications: Company specializing in performing the work of this section with minimum three years experience.

#### **1.06 WARRANTY**

- A. Correct defective Work within a five year period after Date of Substantial Completion.

### **PART 2 PRODUCTS**

#### **2.01 METAL BUILDING**

- A. Single span rigid frame.
- B. Primary Framing: Rigid frame of rafter beams and columns, end wall columns, and wind bracing.
- C. Secondary Framing: Purlins, Girts, Eave struts, and Sill supports, and other items detailed.
- D. Wall System: Preformed, prefinished metal panels of vertical profile, with sub-girt framing/anchorage assembly, and accessory components.
- E. Roof System: Preformed, prefinished Standing Seam metal panels oriented parallel to slope, with sub-girt framing/anchorage assembly and insulation, and accessory components.
- F. Roof Slope: Refer drawings.

#### **2.02 MATERIALS - FRAMING**

- A. Structural Steel Members: ASTM A 572/A 572M, Grade 50.
- B. Structural Tubing: ASTM A 500, Grade B cold-formed.

- C. Plate or Bar Stock: ASTM A 529/A 529M, Grade 50.
- D. Anchor Bolts: ASTM A307, galvanized to ASTM A 153/A 153M.
- E. Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, galvanized to ASTM A 153/A 153M, Class C.
- F. Welding Materials: Type required for materials being welded.
- G. Primer: SSPC-Paint 20, zinc rich.

### **2.03 MATERIALS - WALLS AND ROOF**

- A. Steel Sheet: Hot-dipped galvanized steel sheet, ASTM A653/A653M, SS Grade 33/230, with G90/Z275 coating.
- B. Steel Sheet: ASTM A 792/A 792M aluminum-zinc alloy coated to AZ50/AZM150.
- C. Insulation: Roll glass fiber type, faced with reinforced white vinyl, ASTM E 84 flame spread index of 25 or less where exposed,.
- D. Insulation: Walls and roof: ASTM C665 Type III Class C.
- E. Joint Seal Gaskets: Manufacturer's standard type.
- F. Fasteners: Manufacturer's standard type, galvanized to comply with requirements of ASTM A 153/A 153M, finish to match adjacent surfaces when exterior exposed.
- G. Sealant: Manufacturer's standard type.
- H. Trim, Closure Pieces, Caps, Flashings, Rain Water Diverter: Same material, thickness and finish as exterior sheets; brake formed to required profiles.

### **2.04 COMPONENTS**

- A. Doors and Frames: Specified in Section 08 11 13.
- B. Windows: Specified in Section 08 51 23.

### **2.05 FABRICATION - FRAMING**

- A. Fabricate members in accordance with AISC Specification for plate, bar, tube, or rolled structural shapes.
- B. Anchor Bolts: Formed with straight shank, assembled with template for casting into concrete.

### **2.06 FABRICATION - WALL AND ROOF PANELS**

- A. Siding: Minimum 26 gage metal thickness, R-panel profile with lapped edges fitted with continuous gaskets.
- B. Siding: Provide translucent panels where indicated.
- C. Roofing: Minimum 24 gage metal thickness, Standing Seam profile with lapped edges .
- D. Liner: Minimum 26 gage metal thickness, R-panel profile with lapped edges.
- E. Soffit Panels: Minimum 24 gage metal thickness, flat profile , perforated for ventilation.
- F. Girts/Purlins: Rolled formed structural shape to receive siding, roofing and liner sheet.
- G. Internal and External Corners: Same material thickness and finish as adjacent material, profile brake formed to required angles. Back brace mitered internal corners.
- H. Expansion Joints: Same material and finish as adjacent material where exposed, same gage thickness, manufacturer's standard brake formed type, of profile to suit system.
- I. Flashings, Closure Pieces, Fascia: Same material and finish as adjacent material, profile to suit system.
- J. Fasteners: To maintain load requirements and weather tight installation, same finish as cladding, non-corrosive finish.

### **2.07 FABRICATION - GUTTERS AND DOWNSPOUTS**

- A. Fabricate of same material and finish as roofing metal.

- B. Form sections in maximum possible lengths. Hem exposed edges.
- C. Fabricate support straps of same material and finish as roofing metal, color as selected.

## **2.08 FINISHES**

- A. Framing Members: Clean, prepare, and shop prime in coordination with Division 9 requirements.
- B. Exterior Surfaces of Wall Components and Accessories: Precoated enamel on steel of modified silicone finish, color as selected from manufacturer's standard range.
- C. Interior Surfaces of Wall Components and Accessories: Precoated enamel on steel of modified silicone finish, color as selected from manufacturer's standard range.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that foundation, floor slab, mechanical and electrical utilities, and placed anchors are in correct position

### **3.02 ERECTION - FRAMING**

- A. Erect framing in accordance with AISC 360 - Specification for Structural Steel Buildings.
- B. Provide for erection and wind loads. Provide temporary bracing to maintain structure plumb and in alignment until completion of erection and installation of permanent bracing. Locate braced bays as indicated.
- C. Set column base plates with non-shrink grout to achieve full plate bearing.
- D. Do not field cut or alter structural members without approval.
- E. After erection, prime welds, abrasions, and surfaces not shop primed.

### **3.03 ERECTION - WALL AND ROOF PANELS**

- A. Install in accordance with manufacturer's instructions.
- B. Exercise care when cutting prefinished material to ensure cuttings do not remain on finish surface.
- C. Fasten cladding system to structural supports, aligned level and plumb.
- D. Locate end laps over supports. End laps minimum 2 inches. Place side laps over bearing.
- E. Provide expansion joints where indicated.
- F. Use concealed fasteners.
- G. Install sealant and gaskets to prevent weather penetration.

### **3.04 ERECTION - GUTTERS AND DOWNSPOUTS**

- A. Rigidly support and secure components. Join lengths with formed seams sealed watertight. Flash and seal gutters to downspouts.

### **3.05 INSTALLATION - ACCESSORIES**

- A. Install door frames, doors, overhead doors, and windows and glass in accordance with manufacturer's instructions.
- B. Seal wall and roof accessories watertight and weather tight with sealant in accordance with Section 07 90 05.

### **3.06 TOLERANCES**

- A. Framing Members: 1/4 inch from level; 1/8 inch from plumb.
- B. Siding and Roofing: 1/8 inch from true position.

**END OF SECTION**

## SECTION 22 05 13

### COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Single phase electric motors.
- B. Three phase electric motors.

##### 1.02 REFERENCE STANDARDS

- A. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings; American Bearing Manufacturers Association, Inc.; 1990 (Reapproved 2008).
- B. IEEE 112 - IEEE Standard Test Procedure for Polyphase Induction Motors and Generators; Institute of Electrical and Electronic Engineers; 2004.
- C. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association; 2009, Revision 1 - 2010.
- D. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

##### 1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide wiring diagrams with electrical characteristics and connection requirements.
- C. Test Reports: Indicate test results verifying nominal efficiency and power factor for three phase motors larger than 5 horsepower.
- D. Manufacturer's Installation Instructions: Indicate setting, mechanical connections, lubrication, and wiring instructions.
- E. Operation Data: Include instructions for safe operating procedures.
- F. Maintenance Data: Include assembly drawings, bearing data including replacement sizes, and lubrication instructions.

##### 1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacture of electric motors, and their accessories, with minimum three years documented product development, testing, and manufacturing experience.
- B. Conform to NFPA 70.
- C. Provide certificate of compliance from authority having jurisdiction indicating approval of high efficiency motors.
- D. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

##### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering. For extended outdoor storage, remove motors from equipment and store separately.

##### 1.06 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for motors larger than 20 horsepower.

## **PART 2 PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Lincoln Motors: [www.lincolnmotors.com](http://www.lincolnmotors.com).
- B. A. O. Smith Electrical Products Company: [www.aosmithmotors.com](http://www.aosmithmotors.com).
- C. Reliance Electric/Rockwell Automation: [www.reliance.com](http://www.reliance.com).
- D. Substitutions: See Section 01 60 00 - Product Requirements.

### **2.02 GENERAL CONSTRUCTION AND REQUIREMENTS**

- A. Electrical Service:
  - 1. Motors 1/2 HP and Smaller: 115 volts, single phase, 60 Hz.
  - 2. Motors Larger than 1/2 Horsepower: 208 volts, three phase, 60 Hz.
- B. Nominal Efficiency:
  - 1. Open Motor with Two Poles: 82.5.
  - 2. Open Motor with Four Poles: 82.5.
  - 3. Open Motor with Six poles: 50.0.
  - 4. Enclosed Motor with Two Poles: 75.5.
  - 5. Enclosed Motor with Four Poles: 82.5.
  - 6. Enclosed Motor with Six Poles: 50.0.
- C. Construction:
  - 1. Open drip-proof type except where specifically noted otherwise.
  - 2. Design for continuous operation in 40 degrees C environment.
  - 3. Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.
  - 4. Motors with frame sizes 254T and larger: Energy Efficient Type.
- D. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, and power factor, efficiency.
- E. Wiring Terminations:
  - 1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
  - 2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

### **2.03 SINGLE PHASE POWER - SPLIT PHASE MOTORS**

- A. Starting Torque: Less than 150 percent of full load torque.
- B. Starting Current: Up to seven times full load current.
- C. Breakdown Torque: Approximately 200 percent of full load torque.
- D. Drip-proof Enclosure: Class A (50 degrees C temperature rise) insulation, NEMA Service Factor, prelubricated sleeve or ball bearings.
- E. Enclosed Motors: Class A (50 degrees C temperature rise) insulation, 1.0 Service Factor, prelubricated ball bearings.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.
- C. Check line voltage and phase and ensure agreement with nameplate.

**END OF SECTION**

**SECTION 22 05 19**  
**METERS AND GAGES FOR PLUMBING PIPING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Pressure gages and pressure gage taps.
- B. Thermometers and thermometer wells.
- C. Static pressure gages.
- D. Filter gages.

**1.02 REFERENCE STANDARDS**

- A. ASME B40.100 - Pressure Gauges and Gauge Attachments; The American Society of Mechanical Engineers; 2005.
- B. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers; 2007.
- C. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers; 2007.
- D. UL 393 - Indicating Pressure Gauges for Fire-Protection Service; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.
- E. UL 404 - Gages, Indicating Pressure, for Compressed Gas Service; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

**1.03 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide list that indicates use, operating range, total range and location for manufactured components.
- C. Samples: Submit two of each type of instrument specified.
- D. Project Record Documents: Record actual locations of components and instrumentation.
- E. Maintenance Materials: Furnish the following for New Barite Plant's use in maintenance of project.
  - 1. See Section 01 60 00 - Product Requirements. for additional provisions.

**1.04 FIELD CONDITIONS**

- A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

**PART 2 PRODUCTS**

**2.01 PRESSURE GAGES**

- A. Manufacturers:
  - 1. Dwyer Instruments, Inc: [www.dwyer-inst.com](http://www.dwyer-inst.com).
  - 2. Moeller Instrument Co., Inc: [www.moellerinstrument.com](http://www.moellerinstrument.com).
  - 3. Omega Engineering, Inc: [www.omega.com](http://www.omega.com).
  - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Pressure Gages: ASME B40.100, UL 393 drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.
  - 1. Case: Steel with brass bourdon tube.
  - 2. Size: 4-1/2 inch diameter.
  - 3. Mid-Scale Accuracy: One percent.
  - 4. Scale: Psi and KPa.

**2.02 PRESSURE GAGE TAPPINGS**

- A. Gage Cock: Tee or lever handle, brass for maximum 150 psi.

- B. Needle Valve: Brass, 1/4 inch NPT for minimum 150 psi.
- C. Pulsation Damper: Pressure snubber, brass with 1/4 inch connections.
- D. Syphon: Steel, Schedule 40, 1/4 inch angle or straight pattern.

### **2.03 STEM TYPE THERMOMETERS**

- A. Manufacturers:
  - 1. Dwyer Instruments, Inc: [www.dwyer-inst.com](http://www.dwyer-inst.com).
  - 2. Omega Engineering, Inc: [www.omega.com](http://www.omega.com).
  - 3. Weksler Glass Thermometer Corp: [www.wekslerglass.com](http://www.wekslerglass.com).
  - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Thermometers - Fixed Mounting: Red- or blue-appearing non-toxic liquid in glass; ASTM E1; lens front tube, cast aluminum case with enamel finish.
  - 1. Size: 9 inch scale.
  - 2. Window: Clear Lexan.
  - 3. Accuracy: 2 percent, per ASTM E77.
  - 4. Calibration: Degrees F.
- C. Thermometers - Adjustable Angle: Red- or blue-appearing non-toxic liquid in glass; ASTM E1; lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device; adjustable 360 degrees in horizontal plane, 180 degrees in vertical plane.
  - 1. Size: 9 inch scale.
  - 2. Window: Clear Lexan.
  - 3. Accuracy: 2 percent, per ASTM E77.
  - 4. Calibration: Degrees F.

### **2.04 DIAL THERMOMETERS**

- A. Manufacturers:
  - 1. Dwyer Instruments, Inc: [www.dwyer-inst.com](http://www.dwyer-inst.com).
  - 2. Omega Engineering, Inc: [www.omega.com](http://www.omega.com).
  - 3. Weksler Glass Thermometer Corp: [www.wekslerglass.com](http://www.wekslerglass.com).
  - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Thermometers - Fixed Mounting: Dial type bimetallic actuated; ASTM E1; stainless steel case, silicone fluid damping, white with black markings and black pointer, hermetically sealed lens, stainless steel stem.
  - 1. Size: 5 inch diameter dial.
  - 2. Lens: Clear glass.
  - 3. Accuracy: 1 percent.
  - 4. Calibration: Degrees F.
- C. Thermometers: Dial type vapor or liquid actuated; ASTM E1; stainless steel case, with brass or copper bulb, copper or bronze braided capillary, white with black markings and black pointer, glass lens.
  - 1. Size: 4-1/2 inch diameter dial.
  - 2. Lens: Clear glass.
  - 3. Length of Capillary: Minimum 5 feet.
  - 4. Accuracy: 2 percent.
  - 5. Calibration: Degrees F.

### **2.05 STATIC PRESSURE GAGES**

- A. Manufacturers:
  - 1. Dwyer Instruments, Inc: [www.dwyer-inst.com](http://www.dwyer-inst.com).
  - 2. Omega Engineering, Inc: [www.omega.com](http://www.omega.com).
  - 3. Weksler Glass Thermometer Corp: [www.wekslerglass.com](http://www.wekslerglass.com).

- 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. 3-1/2 inch diameter dial in metal case, diaphragm actuated, black figures on white background, front recalibration adjustment, 2 percent of full scale accuracy.
- C. Accessories: Static pressure tips with compression fittings for bulkhead mounting, 1/4 inch diameter tubing.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Provide one pressure gage per pump, installing taps before strainers and on suction and discharge of pump. Pipe to gage.
- C. Install pressure gages with pulsation dampers. Provide gage cock to isolate each gage. Provide siphon on gages in steam systems. Extend nipples and siphons to allow clearance from insulation.
- D. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inch for installation of thermometer sockets. Ensure sockets allow clearance from insulation.
- E. Install thermometers in air duct systems on flanges.
- F. Install thermometer sockets adjacent to controls systems thermostat, transmitter, or sensor sockets. Refer to Section 23 09 43. Where thermometers are provided on local panels, duct or pipe mounted thermometers are provided on local panels, duct or pipe mounted thermometers are not required.
- G. Locate duct mounted thermometers minimum 10 feet downstream of mixing dampers, coils, or other devices causing air turbulence.
- H. Provide instruments with scale ranges selected according to service with largest appropriate scale.
- I. Install gages and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.
- J. Adjust gages and thermometers to final angle, clean windows and lenses, and calibrate to zero.

**END OF SECTION**

New Barite Plant  
PIPING  
Gardendale, Texas

22 05 19 - 4

METERS AND GAGES FOR PLUMBING

12/15/2011

## SECTION 22 05 53

### IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Stencils.
- D. Pipe Markers.

##### 1.02 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; The American Society of Mechanical Engineers; 2007.
- B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2001 (Reapproved 2007).

##### 1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.
- C. Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- D. Product Data: Provide manufacturers catalog literature for each product required.
- E. Samples: Submit two labels \_\_\_\_ x \_\_\_\_ inch in size.
- F. Manufacturer's Installation Instructions: Indicate special procedures, and installation.
- G. Project Record Documents: Record actual locations of tagged valves.

#### PART 2 PRODUCTS

##### 2.01 IDENTIFICATION APPLICATIONS

- A. Control Panels: Nameplates.
- B. Instrumentation: Tags.
- C. Piping: Tags.
- D. Pumps: Nameplates.
- E. Small-sized Equipment: Tags.
- F. Tanks: Nameplates.
- G. Thermostats: Nameplates.
- H. Valves: Tags and ceiling tacks where located above lay-in ceiling.

##### 2.02 MANUFACTURERS

- A. Brady Corporation: [www.bradycorp.com](http://www.bradycorp.com).
- B. Champion America, Inc: [www.Champion-America.com](http://www.Champion-America.com).
- C. Seton Identification Products: [www.seton.com/aec](http://www.seton.com/aec).
- D. Substitutions: See Section 01 60 00 - Product Requirements.

##### 2.03 NAMEPLATES

- A. Description: Laminated three-layer plastic with engraved letters.
  - 1. Letter Color: White.
  - 2. Letter Height: 1/4 inch.
  - 3. Background Color: Black.

## 2.04 TAGS

- A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.
- B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

## 2.05 STENCILS

- A. Stencils: With clean cut symbols and letters of following size:
  - 1. 3/4 to 1-1/4 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 1/2 inch high letters.
  - 2. 1-1/2 to 2 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 3/4 inch high letters.
  - 3. 2-1/2 to 6 inch Outside Diameter of Insulation or Pipe: 12 inch long color field, 1-1/4 inch high letters.
- B. Stencil Paint: As specified in Section 09 90 00, semi-gloss enamel, colors conforming to ASME A13.1.

## 2.06 PIPE MARKERS

- A. Manufacturers:
  - 1. Brady Corporation: [www.bradycorp.com](http://www.bradycorp.com).
  - 2. Kolbi Pipe Marker Co.: [www.kolbipipemarkers.com](http://www.kolbipipemarkers.com).
  - 3. MIFAB, Inc.: [www.mifab.com](http://www.mifab.com).
  - 4. Seton Identification Products: [www.seton.com](http://www.seton.com).
  - 5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Comply with ASME A13.1.
- C. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
- E. Color code as follows:
  - 1. Potable, Cooling, Boiler, Feed, Other Water: Green with white letters.
  - 2. Fire Quenching Fluids: Red with white letters.
  - 3. Toxic and Corrosive Fluids: Orange with black letters.
  - 4. Flammable Fluids: Yellow with black letters.
  - 5. Combustible Fluids: Brown with white letters.
  - 6. Compressed Air: Blue with white letters.

## 2.07 CEILING TACKS

- A. Manufacturers:
  - 1. Craftmark: [www.craftmarkid.com](http://www.craftmarkid.com).
  - 2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Description: Steel with 3/4 inch diameter color coded head.
- C. Color code as follows:
  - 1. Green - Plumbing valves

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Prepare surfaces in accordance with Section 09 90 00 for stencil painting.

### 3.02 INSTALLATION

- A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.
- C. Apply stencil painting in accordance with Section 09 90 00.
- D. Install plastic pipe markers in accordance with manufacturer's instructions.
- E. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- F. Use tags on piping 3/4 inch diameter and smaller.
  - 1. Identify service, flow direction, and pressure.
  - 2. Install in clear view and align with axis of piping.
  - 3. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.
- G. Identify valves in main and branch piping with tags.
- H. Identify piping, concealed or exposed, with plastic pipe markers or stencils. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.
- I. Provide ceiling tacks to locate valves or dampers above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

**END OF SECTION**



**SECTION 22 07 19**  
**PLUMBING PIPING INSULATION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Piping insulation.
- B. Jackets and accessories.

**1.02 REFERENCE STANDARDS**

- A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2010.
- B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2007.
- C. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2007.
- D. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot Plate Apparatus; 2010.
- E. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007.
- F. ASTM C 449/C 449M - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement; 2000.
- G. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.
- H. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation; 2009.
- I. ASTM C 534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2007a.
- J. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2007e1.
- K. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation; 2007.
- L. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2010a.
- M. ASTM C585 - Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System); 2010.
- N. ASTM C 591 - Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation; 2007.
- O. ASTM C 610 - Standard Specification for Molded Expanded Perlite Block and Pipe Thermal Insulation; 2005.
- P. ASTM C 795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2003.
- Q. ASTM D1056 - Standard Specification for Flexible Cellular Materials--Sponge or Expanded Rubber; 2007.
- R. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2006.
- S. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2010b.
- T. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2010.
- U. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.
- V. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

**1.03 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.
- C. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

#### **1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum 3 years of experience.

#### **1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

#### **1.06 FIELD CONDITIONS**

- A. Maintain ambient conditions required by manufacturers of each product.
- B. Maintain temperature before, during, and after installation for minimum of 24 hours.

### **PART 2 PRODUCTS**

#### **2.01 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION**

- A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E 84, NFPA 255, or UL 723.

#### **2.02 GLASS FIBER**

- A. Manufacturers:
  - 1. Johns Manville Corporation: [www.jm.com](http://www.jm.com).
  - 2. Owens Corning Corp: [www.owenscorning.com](http://www.owenscorning.com).
  - 3. CertainTeed Corporation: [www.certainteed.com](http://www.certainteed.com).
  - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Insulation: ASTM C547 and ASTM C 795; rigid molded, noncombustible.
  - 1. 'K' value: ASTM C177, 0.24 at 75 degrees F.
  - 2. Maximum service temperature: 850 degrees F.
  - 3. Maximum moisture absorption: 0.2 percent by volume.
- C. Insulation: ASTM C547 and ASTM C 795; semi-rigid, noncombustible, end grain adhered to jacket.
  - 1. 'K' value: ASTM C177, 0.24 at 75 degrees F.
  - 2. Maximum service temperature: 650 degrees F.
  - 3. Maximum moisture absorption: 0.2 percent by volume.
- D. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.
- E. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.
- F. Vapor Barrier Lap Adhesive:
  - 1. Compatible with insulation.
- G. Insulating Cement/Mastic:
  - 1. ASTM C195; hydraulic setting on mineral wool.
- H. Fibrous Glass Fabric:
  - 1. Cloth: Untreated; 9 oz/sq yd weight.
  - 2. Blanket: 1.0 lb/cu ft density.
  - 3. Weave: 5x5.
- I. Indoor Vapor Barrier Finish:

1. Cloth: Untreated; 9 oz/sq yd weight.
  2. Vinyl emulsion type acrylic, compatible with insulation, black color.
- J. Insulating Cement:
1. ASTM C449/C449M.

## **2.03 JACKETS**

- A. PVC Plastic.
1. Manufacturers:
    - a. Johns Manville Corporation: [www.jm.com](http://www.jm.com).
    - b. Substitutions: See Section 01 60 00 - Product Requirements.
  2. Jacket: One piece molded type fitting covers and sheet material, off-white color.
    - a. Minimum Service Temperature: 0 degrees F.
    - b. Maximum Service Temperature: 150 degrees F.
    - c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
    - d. Thickness: 10 mil.
    - e. Connections: Brush on welding adhesive.
  3. Covering Adhesive Mastic:
    - a. Compatible with insulation.
- B. ABS Plastic:
1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
    - a. Minimum Service Temperature: -40 degrees F.
    - b. Maximum Service Temperature of 180 degrees F.
    - c. Moisture Vapor Permeability: 0.012 perm inch, when tested in accordance with ASTM E96/E96M.
    - d. Thickness: 30 mil.
    - e. Connections: Brush on welding adhesive.
- C. Canvas Jacket: UL listed 6 oz/sq yd plain weave cotton fabric treated with dilute fire retardant lagging adhesive.
1. Lagging Adhesive:
    - a. Compatible with insulation.
- D. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.
1. Thickness: 0.016 inch sheet.
  2. Finish: Smooth.
  3. Joining: Longitudinal slip joints and 2 inch laps.
  4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
  5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.
- E. Stainless Steel Jacket: ASTM A666, Type 304 stainless steel.
1. Thickness: 0.010 inch.
  2. Finish: Smooth.
  3. Metal Jacket Bands: 3/8 inch wide; 0.010 inch thick stainless steel.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

### **3.02 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Exposed Piping: Locate insulation and cover seams in least visible locations.

- D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- E. Glass fiber insulated pipes conveying fluids below ambient temperature:
  - 1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
  - 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- F. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
- G. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.
- H. Glass fiber insulated pipes conveying fluids above ambient temperature:
  - 1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
  - 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- I. Inserts and Shields:
  - 1. Application: Piping 1-1/2 inches diameter or larger.
  - 2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
  - 3. Insert location: Between support shield and piping and under the finish jacket.
  - 4. Insert configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
  - 5. Insert material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.
- J. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 07 84 00.
- K. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with canvas jacket sized for finish painting.
- L. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

### 3.03 SCHEDULES

- A. Plumbing Systems:
  - 1. Domestic Hot Water Supply:
    - a. Glass Fiber Insulation:
      - 1) Pipe Size Range: to 1-1/2 inch.
      - 2) Thickness: 1 inch.
  - 2. Domestic Hot Water Recirculation:
    - a. Glass Fiber Insulation:
      - 1) Pipe Size Range: All sizes.
      - 2) Thickness: 1 inch.

**END OF SECTION**

**SECTION 22 10 05**  
**PLUMBING PIPING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Pipe, pipe fittings, valves, and connections for piping systems.
  - 1. Sanitary sewer.
  - 2. Industrial waste.
  - 3. Domestic water.

**1.02 REFERENCE STANDARDS**

- A. ANSI Z21.22 - American National Standard for Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems; 1999, and addenda A&B (R2004).
- B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; 2001 (R2005) (ANSI B16.18).
- C. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings; The American Society of Mechanical Engineers; 2001 (R2005).
- D. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV; The American Society of Mechanical Engineers; 2002.
- E. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes; The American Society of Mechanical Engineers; 2006.
- F. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV; The American Society of Mechanical Engineers[].
- G. ASME B31.1 - Power Piping; The American Society of Mechanical Engineers; 2007 (ANSI/ASME B31.1).
- H. ASME B31.2 - Fuel Gas Piping; The American Society of Mechanical Engineers; 1968.
- I. ASME B31.9 - Building Services Piping; The American Society of Mechanical Engineers; 2008 (ANSI/ASME B31.9).
- J. ASME (BPV IV) - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers; The American Society of Mechanical Engineers; 2007.
- K. ASME (BPV IX) - Boiler and Pressure Vessel Code, Section IX - Welding and Brazing Qualifications; The American Society of Mechanical Engineers; 2010.
- L. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2009.
- M. ASTM B32 - Standard Specification for Solder Metal; 2008.
- N. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes; 2010.
- O. ASTM B75 - Standard Specification for Seamless Copper Tube; 2002 (Reapproved 2010).
- P. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2009.
- Q. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2005.
- R. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service; 2008.
- S. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2009a.
- T. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2006.
- U. ASTM D2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series); 2009.
- V. ASTM D2466 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40; 2006.

- W. ASTM D2513 - Standard Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings; 2011e1.
- X. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2004 (Reapproved 2009).
- Y. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2010.
- Z. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2011.
- AA. ASTM D2846/D2846M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems; 2009b.
- AB. ASTM D2855 - Standard Practice for Making Solvent-Cemented Joints with Poly(Vinyl Chloride) (PVC) Pipe and Fittings; 1996 (Reapproved 2010).
- AC. ASTM F438 - Standard Specification for Socket-Type Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 40; 2009.
- AD. ASTM F439 - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe Fittings, Schedule 80; 2009.
- AE. ASTM F441/F441M - Standard Specification for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe, Schedules 40 and 80; 2009.
- AF. ASTM F493 - Standard Specification for Solvent Cements for Chlorinated Poly (Vinyl Chloride) (CPVC) Plastic Pipe and Fittings; 2010.
- AG. ASTM F 679 - Standard Specification for Poly(Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings[].
- AH. ASTM F 708 - Standard Practice for Design and Installation of Rigid Pipe Hangers[].
- AI. ASTM F1281 - Standard Specification for Crosslinked Polyethylene/Aluminum/Crosslinked Polyethylene (PEX-AL-PEX) Pressure Pipe; 2007.
- AJ. AWS A5.8/A5.8M - Specification for Filler Metals for Brazing and Braze Welding; American Welding Society; 2004 and errata.
- AK. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; American Water Works Association; 2005 (ANSI/AWWA C105/A21.5).
- AL. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; American Water Works Association; 2007 (ANSI/AWWA C111/A21.11).
- AM. AWWA C651 - Disinfecting Water Mains; American Water Works Association; 2005 (ANSI/AWWA C651).
- AN. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications; Cast Iron Soil Pipe Institute; 2005.
- AO. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; Cast Iron Soil Pipe Institute; 2004
- AP. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2009.
- AQ. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements; 2006.
- AR. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2010.
- AS. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2009.
- AT. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2009.

- AU. MSS SP-67 - Butterfly Valves; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2002a.
- AV. MSS SP-69 - Pipe Hangers and Supports - Selection and Application; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.[].
- AW. MSS SP-71 - Cast Iron Swing Check Valves, Flanged and Threaded Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2005.
- AX. MSS SP-80 - Bronze Gate, Globe, Angle and Check Valves; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2008.
- AY. MSS SP-85 - Cast Iron Globe & Angle Valves, Flanged and Threaded Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 2002.
- AZ. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.; 1996.
- BA. NFPA 54 - National Fuel Gas Code; National Fire Protection Association; 2009.

### **1.03 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.
- C. Shop Drawings: For non-penetrating rooftop supports, submit detailed layout developed for this project, with design calculations for loadings and spacings.
- D. Project Record Documents: Record actual locations of valves.
- E. Maintenance Materials: Furnish the following for New Barite Plant's use in maintenance of project.
  - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
  - 2. Valve Repacking Kits: One for each type and size of valve.

### **1.04 QUALITY ASSURANCE**

- A. Perform work in accordance with applicable codes.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.
- C. Welding Materials and Procedures: Conform to ASME (BPV IX) and applicable state labor regulations.
- D. Welder Qualifications: Certified in accordance with ASME (BPV IX).
- E. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

### **1.05 REGULATORY REQUIREMENTS**

- A. Perform Work in accordance with applicable plumbing code and all locally adopted amendments.
- B. Conform to applicable code for installation of backflow prevention devices.
- C. Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

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

- A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B. Provide temporary protective coating on cast iron and steel valves.
- C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

## 1.07 FIELD CONDITIONS

- A. Do not install underground piping when bedding is wet or frozen.

## PART 2 PRODUCTS

### 2.01 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING

- A. Cast Iron Pipe: ASTM A74 extra heavy weight.
  - 1. Fittings: Cast iron.
  - 2. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets or lead and oakum.

### 2.02 SANITARY SEWER PIPING, ABOVE GRADE

- A. Cast Iron Pipe: ASTM A74, service weight.
  - 1. Fittings: Cast iron.
  - 2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.
- B. Cast Iron Pipe: CISPI 301, hubless, service weight.
  - 1. Fittings: Cast iron.
  - 2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

### 2.03 WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

- A. Copper Pipe: ASTM B 42, hard drawn for building service, soft annealed for trap primer lines, Type K (A).
  - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22 wrought copper and bronze.
  - 2. Joints: ASTM B 32, alloy Sn95 solder.

### 2.04 WATER PIPING, ABOVE GRADE

- A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).
  - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
  - 2. Joints: ASTM B32, alloy Sn95 solder.

### 2.05 FLANGES, UNIONS, AND COUPLINGS

- A. Unions for Pipe Sizes 3 Inches and Under:
  - 1. Ferrous pipe: Class 150 malleable iron threaded unions.
  - 2. Copper tube and pipe: Class 150 bronze unions with soldered joints.
- B. Flanges for Pipe Size Over 1 Inch:
  - 1. Ferrous pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
  - 2. Copper tube and pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.
- C. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.
  - 1. Dimensions and Testing: In accordance with AWWA C606.
  - 2. Housing Material: , galvanized.
  - 3. Gasket Material: EPDM suitable for operating temperature range from -30 degrees F to 230 degrees F.
  - 4. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.
  - 5. When pipe is field grooved, provide coupling manufacturer's grooving tools.
  - 6. Manufacturers:
    - a. Grinnell Mechanical Products/Tyco Fire Suppression & Building Products: [www.grinnell.com](http://www.grinnell.com).
    - b. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Grooved and Shouldered Pipe End Couplings:
  - 1. Housing: Malleable iron clamps to engage and lock, designed to permit some angular deflection, contraction, and expansion; steel bolts, nuts, and washers; galvanized for galvanized pipe.

2. Sealing gasket: "C" shape composition sealing gasket.
- E. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

## 2.06 PIPE HANGERS AND SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58.
1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
  2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
  3. Trapeze Hangers: Welded steel channel frames attached to structure.
  4. Vertical Pipe Support: Steel riser clamp.
  5. Floor Supports: Concrete pier or steel pedestal with floor flange; fixture attachment.
- B. Plumbing Piping - Drain, Waste, and Vent:
1. Conform to ASME B31.9.
  2. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
  3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
  4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
  5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
  6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
  7. Vertical Support: Steel riser clamp.
  8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
  9. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- C. Plumbing Piping - Water:
1. Conform to ASME B31.9.
  2. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
  3. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
  4. Hangers for Hot Pipe Sizes 2 Inches to 4 Inches: Carbon steel, adjustable, clevis.
  5. Multiple or Trapeze Hangers: Steel channels with welded supports or spacers and hanger rods.
  6. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
  7. Vertical Support: Steel riser clamp.
  8. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
  9. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.
- D. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
  2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
  3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
  4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
  5. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.
  6. Other Types: As required.
  7. Manufacturers:
    - a. Powers Fasteners, Inc: [www.powers.com](http://www.powers.com).
    - b. Substitutions: See Section 01 60 00 - Product Requirements.

## 2.07 GATE VALVES

- A. Manufacturers:
1. Tyco Flow Control: [www.tycoflowcontrol.com](http://www.tycoflowcontrol.com).

2. Conbraco Industries: [www.conbraco.com](http://www.conbraco.com).
  3. Nibco, Inc: [www.nibco.com](http://www.nibco.com).
  4. Milwaukee Valve Company: [www.milwaukeevalve.com](http://www.milwaukeevalve.com).
  5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Up To and Including 3 Inches:
1. MSS SP-80, Class 125, bronze body, bronze trim, rising stem, handwheel, inside screw, solid wedge disc, solder ends.

## 2.08 GLOBE VALVES

- A. Manufacturers:
1. Tyco Flow Control: [www.tycoflowcontrol.com](http://www.tycoflowcontrol.com).
  2. Conbraco Industries: [www.conbraco.com](http://www.conbraco.com).
  3. Nibco, Inc: [www.nibco.com](http://www.nibco.com).
  4. Milwaukee Valve Company: [www.milwaukeevalve.com](http://www.milwaukeevalve.com).
  5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Up To and Including 3 Inches:
1. MSS SP-80, Class 125, bronze body, bronze trim, handwheel, bronze disc, solder ends.
- C. 2 Inches and Larger:
1. MSS SP-85, Class 125, iron body, bronze trim, handwheel, outside screw and yoke, renewable bronze plug-type disc, renewable seat, flanged ends. Provide chain-wheel operators for valves 6 inches and larger mounted over 8 feet above floor.

## 2.09 BALL VALVES

- A. Manufacturers:
1. Tyco Flow Control: [www.tycoflowcontrol.com](http://www.tycoflowcontrol.com).
  2. Conbraco Industries: [www.conbraco.com](http://www.conbraco.com).
  3. Nibco, Inc: [www.nibco.com](http://www.nibco.com).
  4. Milwaukee Valve Company: [www.milwaukeevalve.com](http://www.milwaukeevalve.com).
  5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Construction, 4 Inches and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze, three piece body, chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with balancing stops, solder ends with union.

## 2.10 BUTTERFLY VALVES

- A. Manufacturers:
1. Tyco Flow Control: [www.tycoflowcontrol.com](http://www.tycoflowcontrol.com).
  2. Hammond Valve: [www.hammondvalve.com](http://www.hammondvalve.com).
  3. Crane Co.: [www.cranvalve.com](http://www.cranvalve.com).
  4. Milwaukee Valve Company: [www.milwaukeevalve.com](http://www.milwaukeevalve.com).
  5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Construction 1-1/2 Inches and Larger: MSS SP-67, 200 psi CWP, cast or ductile iron body, nickel-plated ductile iron disc, resilient replaceable EPDM seat, wafer ends, extended neck, 10 position lever handle.
- C. Provide gear operators for valves 8 inches and larger, and chain-wheel operators for valves mounted over 8 feet above floor.

## 2.11 SWING CHECK VALVES

- A. Manufacturers:
1. Tyco Flow Control: [www.tycoflowcontrol.com](http://www.tycoflowcontrol.com).
  2. Hammond Valve: [www.hammondvalve.com](http://www.hammondvalve.com).
  3. Nibco, Inc: [www.nibco.com](http://www.nibco.com).
  4. Milwaukee Valve Company: [www.milwaukeevalve.com](http://www.milwaukeevalve.com).
  5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Up to 2 Inches:

1. MSS SP-80, Class 125, bronze body and cap, bronze swing disc with rubber seat, solder ends.
- C. Over 2 Inches:
  1. MSS SP-71, Class 125, iron body, bronze swing disc, renewable disc seal and seat, flanged or grooved ends.

## **2.12 RELIEF VALVES**

- A. Pressure Relief:
  1. Manufacturers:
    - a. Tyco Flow Control: [www.tycoflowcontrol.com](http://www.tycoflowcontrol.com).
    - b. Cla-Val Co: [www.cla-val.com](http://www.cla-val.com).
    - c. Henry Technologies: [www.henrytech.com](http://www.henrytech.com).
    - d. Watts Regulator Company: [www.wattsregulator.com](http://www.wattsregulator.com).
    - e. Substitutions: See Section 01 60 00 - Product Requirements.
  2. AGA Z21.22 certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.
- B. Temperature and Pressure Relief:
  1. Manufacturers:
    - a. Cla-Val Co: [www.cla-val.com](http://www.cla-val.com).
    - b. Henry Technologies: [www.henrytech.com](http://www.henrytech.com).
    - c. Watts Regulator Company: [www.wattsregulator.com](http://www.wattsregulator.com).
    - d. Substitutions: See Section 01 60 00 - Product Requirements.
  2. AGA Z21.22 certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F, capacity ASME (BPV IV) certified and labelled.

## **2.13 STRAINERS**

- A. Manufacturers:
  1. Armstrong International, Inc: [www.armstronginternational.com](http://www.armstronginternational.com).
  2. Green Country Filtration: [greencountryfiltration.com](http://greencountryfiltration.com).
  3. WEAMCO: [www.weamco.com](http://www.weamco.com).
  4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Size 2 inch and Under:
  1. Threaded brass body for 175 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.
  2. Class 150, threaded bronze body 300 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.
- C. Size 1-1/2 inch to 4 inch:
  1. Class 125, flanged iron body, Y pattern with 1/16 inch stainless steel perforated screen.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that excavations are to required grade, dry, and not over-excavated.

### **3.02 PREPARATION**

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

### **3.03 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 22 05 16.
- G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 22 07 19.
- H. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors with Section 08 31 00.
- I. Establish elevations of buried piping outside the building to ensure not less than 3 ft of cover.
- J. Install vent piping penetrating roofed areas to maintain integrity of roof assembly.
- K. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- L. Provide support for utility meters in accordance with requirements of utility companies.
- M. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting. Refer to Section 09 90 00.
- N. Excavate in accordance with Section 31 23 16.
- O. Backfill in accordance with Section 31 23 23.
- P. Install bell and spigot pipe with bell end upstream.
- Q. Install valves with stems upright or horizontal, not inverted.
- R. Pipe vents from gas pressure reducing valves to outdoors and terminate in weather proof hood.
- S. Install water piping to ASME B31.9.
- T. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.
- U. Sleeve pipes passing through partitions, walls and floors.
- V. Inserts:
  - 1. Provide inserts for placement in concrete formwork.
  - 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
  - 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
  - 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
  - 5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.
- W. Pipe Hangers and Supports:
  - 1. Install in accordance with ASME B31.9.
  - 2. Support horizontal piping as scheduled.
  - 3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
  - 4. Place hangers within 12 inches of each horizontal elbow.
  - 5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
  - 6. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
  - 7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
  - 8. Provide copper plated hangers and supports for copper piping.

9. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
10. Provide hangers adjacent to motor driven equipment with vibration isolation; refer to Section 22 05 48.
11. Support cast iron drainage piping at every joint.

#### **3.04 APPLICATION**

- A. Use grooved mechanical couplings and fasteners only in accessible locations.
- B. Install unions downstream of valves and at equipment or apparatus connections.
- C. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
- D. Install gate valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- E. Install globe valves for throttling, bypass, or manual flow control services.
- F. Provide lug end butterfly valves adjacent to equipment when provided to isolate equipment.
- G. Provide spring loaded check valves on discharge of water pumps.

#### **3.05 TOLERANCES**

- A. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/4 inch per foot slope.
- B. Water Piping: Slope at minimum of 1/32 inch per foot and arrange to drain at low points.

#### **3.06 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM**

- A. Disinfect water distribution system in accordance with Section 33 13 00.
- B. Prior to starting work, verify system is complete, flushed and clean.
- C. Ensure Ph of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- D. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.
- E. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- F. Maintain disinfectant in system for 24 hours.
- G. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- H. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- I. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

#### **3.07 SERVICE CONNECTIONS**

- A. Provide new sanitary sewer services. Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.
- B. Provide new water service complete with approved double check backflow preventer and water meter with by-pass valves .
  1. Provide 18 gage galvanized sheet metal sleeve around service main to 6 inch above floor and 6 feet minimum below grade. Size for minimum of 2 inches of loose batt insulation stuffing.

#### **3.08 SCHEDULES**

- A. Pipe Hanger Spacing:
  1. Metal Piping:
    - a. Pipe size: 1/2 inches to 1-1/4 inches:
      - 1) Maximum hanger spacing: 6.5 ft.
      - 2) Hanger rod diameter: 3/8 inches.

- b. Pipe size: 1-1/2 inches to 2 inches:
  - 1) Maximum hanger spacing: 10 ft.
  - 2) Hanger rod diameter: 3/8 inch.
- c. Pipe size: 2-1/2 inches to 3 inches:
  - 1) Maximum hanger spacing: 10 ft.
  - 2) Hanger rod diameter: 1/2 inch.
- d. Pipe size: 4 inches to 6 inches:
  - 1) Maximum hanger spacing: 10 ft.
  - 2) Hanger rod diameter: 5/8 inch.

**END OF SECTION**

**SECTION 22 10 06**  
**PLUMBING PIPING SPECIALTIES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Floor drains.
- B. Cleanouts.
- C. Hose bibbs.
- D. Hydrants.
- E. Backflow preventers.
- F. Water hammer arrestors.
- G. Interceptors/separators.
- H. Thermostatic mixing valves.

**1.02 RELATED REQUIREMENTS**

**1.03 REFERENCE STANDARDS**

- A. ASME A112.6.3 - Floor and Trench Drains; The American Society of Mechanical Engineers; 2001 (R2007).
- B. ASSE 1011 - Hose Connection Vacuum Breakers; American Society of Sanitary Engineering; 2004 (ANSI/ASSE 1011).
- C. ASSE 1012 - Backflow Preventer with Intermediate Atmospheric Vent; American Society of Sanitary Engineering; 2002 (ANSI/ASSE 1012).
- D. ASSE 1019 - Vacuum Breaker Wall Hydrants, Freeze Resistant Automatic Draining Type; American Society of Sanitary Engineering; 2004, and Errata 2005 (ANSI/ASSE 1019).
- E. PDI-WH 201 - Water Hammer Arresters; Plumbing and Drainage Institute; 2006.

**1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.
- C. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.
- D. Certificates: Certify that oil interceptors meet or exceed specified requirements.
- E. Manufacturer's Instructions: Indicate Manufacturer's Installation Instructions: Indicate assembly and support requirements.
- F. Project Record Documents: Record actual locations of equipment, cleanouts, backflow preventers, water hammer arrestors and interceptors.
- G. Operation Data: Indicate frequency of treatment required for interceptors.
- H. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.
- I. Maintenance Materials: Furnish the following for New Barite Plant's use in maintenance of project.
  - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
  - 2. Extra Loose Keys for Outside Hose Bibbs: Two.
  - 3. Extra Hose End Vacuum Breakers for Hose Bibbs: Two.

**1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years documented experience.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Accept specialties on site in original factory packaging. Inspect for damage.

## **PART 2 PRODUCTS**

### **2.01 DRAINS**

- A. Manufacturers:
  - 1. Josam Company: [www.josam.com](http://www.josam.com).
  - 2. Jay R. Smith Manufacturing Company: [www.jayrsmith.com](http://www.jayrsmith.com).
  - 3. Zurn Industries, Inc: [www.zurn.com](http://www.zurn.com).
  - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Floor Drain (FD):
  - 1. ASME A112.6.3; lacquered cast iron two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer.
- C. Floor Sink (FS):
  - 1. Lacquered cast iron body with dome strainer, epoxy coated interior, aluminum dome strainer, three-quarter grate and seepage flange.

### **2.02 CLEANOUTS**

- A. Manufacturers:
  - 1. Jay R. Smith Manufacturing Company: [www.jayrsmith.com](http://www.jayrsmith.com).
  - 2. Josam Company: [www.josam.com](http://www.josam.com).
  - 3. Zurn Industries, Inc: [www.zurn.com](http://www.zurn.com).
  - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Cleanouts at Exterior Surfaced Areas (GCO or TWO-WAY CO):
  - 1. Round cast nickel bronze access frame and non-skid cover.
- C. Cleanouts at Interior Finished Floor Areas (CO):
  - 1. Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.
- D. Cleanouts at Interior Finished Wall Areas (WCO):
  - 1. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

### **2.03 HOSE BIBBS**

- A. Manufacturers:
  - 1. Jay R. Smith Manufacturing Company: [www.jayrsmith.com](http://www.jayrsmith.com).
  - 2. Watts Regulator Company: [www.wattsregulator.com](http://www.wattsregulator.com).
  - 3. Zurn Industries, Inc: [www.zurn.com](http://www.zurn.com).
  - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Interior Hose Bibbs:
  - 1. Bronze or brass with integral mounting flange, replaceable hexagonal disc, hose thread spout, chrome plated where exposed with handwheel, integral vacuum breaker in conformance with ASSE 1011.

### **2.04 HYDRANTS**

- A. Manufacturers:
  - 1. Jay R. Smith Manufacturing Company: [www.jayrsmith.com](http://www.jayrsmith.com).
  - 2. Zurn Industries, Inc: [www.zurn.com](http://www.zurn.com).
  - 3. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Wall Hydrants (NFWH):
  - 1. ASSE 1019; freeze resistant, self-draining type with chrome plated wall plate hose thread spout, handwheel, and vacuum breaker.
- C. Wall Hydrants (MCWH):

1. ASSE 1011; moderate climate, self-draining type with chrome plated wall plate hose thread spout, vandal resistant with operating key, 3/4 inch hose connection, and integral vacuum breaker.

## **2.05 DOUBLE CHECK VALVE ASSEMBLIES**

- A. Manufacturers:
  1. Watts Regulator Company: [www.wattsregulator.com](http://www.wattsregulator.com).
  2. Zurn Industries, Inc: [www.zurn.com](http://www.zurn.com).
  3. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Double Check Valve Assemblies:
  1. ASSE 1012; Bronze body with corrosion resistant internal parts and stainless steel springs; two independently operating check valves with intermediate atmospheric vent.

## **2.06 WATER HAMMER ARRESTORS**

- A. Manufacturers:
  1. Jay R. Smith Manufacturing Company: [www.jayrsmith.com](http://www.jayrsmith.com).
  2. Watts Regulator Company: [www.wattsregulator.com](http://www.wattsregulator.com).
  3. Zurn Industries, Inc: [www.zurn.com](http://www.zurn.com).
  4. PPP, Inc.: [www.pppinc.net](http://www.pppinc.net)
  5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Water Hammer Arrestors:
  1. Copper construction, piston type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range -100 to 300 degrees F and maximum 250 psi working pressure.

## **2.07 SUMPS AND INTERCEPTORS**

- A. Manufacturers:
  1. Jay R. Smith Manufacturing Company: [www.jayrsmith.com](http://www.jayrsmith.com).
  2. Park Industries: [www.park-usa.com](http://www.park-usa.com)
  3. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Oil/Water Separators (INT-S):
  1. Construction:
    - a. Material: Precast concrete.
    - b. Rough-in: Exterior, below grade with extension rings as required.
    - c. Accessories: Stop-flow automatic shut-off valve at outlet.
    - d. Cover: 24" diameter heavy duty cast iron frame and cover .
    - e. Unit Rating: 500 gallons capacity and 250 gallons of oil capacity.

## **2.08 MIXING VALVES**

- A. Thermostatic Mixing Valves:
  1. Manufacturers:
    - a. Leonard Valve Company: [www.leonardvalve.com](http://www.leonardvalve.com).
    - b. Substitutions: See Section 01 60 00 - Product Requirements.
  2. Valve: Chrome plated cast brass body, stainless steel or copper alloy bellows, integral temperature adjustment.
  3. Capacity: 18 gpm at 125 psi differential.
  4. Accessories:
    - a. Check valve on inlets.
    - b. Volume control shut-off valve on outlet.
    - c. Stem thermometer on outlet.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.

- B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
- C. Encase exterior cleanouts in concrete flush with grade.
- D. Install floor cleanouts at elevation to accommodate finished floor.
- E. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.
- F. Pipe relief from backflow preventer to nearest drain.
- G. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to quick closing valves.

**END OF SECTION**

**SECTION 22 30 00**  
**PLUMBING EQUIPMENT**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Water heaters.
- B. Compression tanks.
- C. Pumps.
  - 1. Circulators.
- D. Water pressure booster system.

**1.02 REFERENCE STANDARDS**

- A. ASME (BPV VIII, 1) - Boiler and Pressure Vessel Code, Section VIII, Division 1 - Rules for Construction of Pressure Vessels; The American Society of Mechanical Engineers; 2007.
- B. UL 1453 - Standard for Electric Booster and Commercial Storage Tank Water Heaters; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

**1.03 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittals procedures.
- B. Product Data:
  - 1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
  - 2. Indicate pump type, capacity, power requirements.
  - 3. Provide certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.
  - 4. Provide electrical characteristics and connection requirements.
- C. Shop Drawings:
  - 1. Indicate dimensions of tanks, tank lining methods, anchors, attachments, lifting points, tappings, and drains.
- D. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.
- E. Warranty: Submit manufacturer warranty and ensure forms have been completed in New Barite Plant's name and registered with manufacturer.
- F. Maintenance Materials: Furnish the following for New Barite Plant's use in maintenance of project.
  - 1. See Section 01 60 00 - Product Requirements, for additional provisions.

**1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Identification: Provide pumps with manufacturer's name, model number, and rating/capacity identified by permanently attached label.
- C. Performance: Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, operate within 25 percent of midpoint of published maximum efficiency curve.

**1.05 CERTIFICATIONS**

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

### **1.07 WARRANTY**

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for domestic water heaters.

## **PART 2 PRODUCTS**

### **2.01 WATER HEATER MANUFACTURERS**

- A. A.O. Smith Water Products Co: [www.hotwater.com](http://www.hotwater.com).
- B. Bock Water Heaters, Inc: [www.bockwaterheaters.com](http://www.bockwaterheaters.com).
- C. Rheem Manufacturing Company: [www.rheem.com](http://www.rheem.com).
- D. Substitutions: See Section 01 60 00 - Product Requirements.

### **2.02 COMMERCIAL ELECTRIC WATER HEATERS**

- A. Type: Factory-assembled and wired, electric, vertical storage.
- B. Performance:
- C. Electrical Characteristics:
- D. Tank: Glass lined welded steel; 4 inch diameter inspection port, thermally insulated with minimum 2 inches glass fiber encased in corrosion-resistant steel jacket; baked-on enamel finish.
- E. Controls: Automatic immersion water thermostat; externally adjustable temperature range from 60 to 180 degrees F, flanged or screw-in nichrome elements, high temperature limit thermostat.
- F. Accessories: Provide:
  - 1. Water connections: Brass.
  - 2. Dip tube.
  - 3. Drain Valve.
  - 4. Anode: Magnesium.
  - 5. Temperature and Pressure Relief Valve: ASME labelled.
- G. Heating Elements: Flange-mounted immersion elements; individual elements sheathed with Incoloy corrosion-resistant metal alloy, rated less than 75 Watts per square inch.

### **2.03 IN-LINE CIRCULATOR PUMPS**

- A. Manufacturers:
  - 1. Armstrong Pumps Inc: [www.armstrongpumps.com](http://www.armstrongpumps.com).
  - 2. ITT Bell & Gossett: [www.bellgossett.com](http://www.bellgossett.com).
  - 3. Sterling Fluid Systems: [www.sterlingfluid.com](http://www.sterlingfluid.com).
  - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Casing: Bronze, rated for 125 psig working pressure, with stainless steel rotor assembly.
- C. Impeller: Bronze.
- D. Shaft: Alloy steel with integral thrust collar and two oil lubricated bronze sleeve bearings.
- E. Seal: Carbon rotating against a stationary ceramic seat.
- F. Drive: Flexible coupling.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions of certification, if any.
- B. Coordinate with plumbing piping and related electrical work to achieve operating system.

**END OF SECTION**

**SECTION 22 40 00**  
**PLUMBING FIXTURES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Water closets.
- B. Urinals.
- C. Lavatories.
- D. Sinks.
- E. Service sinks.
- F. Electric water coolers.
- G. Showers.
- H. Eye and face wash fountains.
- I. Emergency showers.

**1.02 REFERENCE STANDARDS**

- A. ANSI Z358.1 - American National Standard for Emergency Eyewash and Shower Equipment; 2009.
- B. ASHRAE Std 18 - Methods of Testing for Rating Drinking-Water Coolers with Self-Contained Mechanical Refrigeration; 2006.
- C. ASME A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use; The American Society of Mechanical Engineers; 1997 (Reaffirmed 2002).
- D. ASME A112.18.1 - Plumbing Supply Fittings; The American Society of Mechanical Engineers; 2005.
- E. ASME A112.19.2 - Vitreous China Plumbing Fixtures and Hydraulic Requirements for Water Closets and Urinals; The American Society of Mechanical Engineers; 2008.
- F. ASME A112.19.3 - Stainless Steel Plumbing Fixtures (Designed for Residential Use); The American Society of Mechanical Engineers; 2008.
- G. ASME A112.19.5 - Trim for Water-Closet Bowls, Tanks and Urinals; The American Society of Mechanical Engineers; 2005.

**1.03 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.
- C. Manufacturer's Instructions: Indicate installation methods and procedures.
- D. Maintenance Data: Include fixture trim exploded view and replacement parts lists.
- E. Warranty: Submit manufacturer warranty and ensure forms have been completed in New Barite Plant's name and registered with manufacturer.
- F. Maintenance Materials: Furnish the following for New Barite Plant's use in maintenance of project.
  - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
  - 2. Extra Faucet Washers: Two sets of each type and size.
  - 3. Extra Lavatory Supply Fittings: One set of each type and size.
  - 4. Flush Valve Service Kits: Two for each type and size.

**1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

## 1.05 REGULATORY REQUIREMENTS

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

## 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Accept fixtures on site in factory packaging. Inspect for damage.
- B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

## 1.07 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for electric water cooler.

## PART 2 PRODUCTS

### 2.01 FLUSH VALVE WATER CLOSETS

- A. Water Closets: Vitreous china, ASME A112.19.2, floor mounted, siphon jet flush action, china bolt caps.
  - 1. Bowl: 16.5 inches high with elongated rim.
  - 2. Flush Volume: 1.6 gallon, maximum.
  - 3. Flush Valve: Exposed (top spud).
  - 4. Flush Operation: Sensor operated.
  - 5. Handle Height: 44 inches or less.
  - 6. Supply Size: 1-1/2 inches.
  - 7. Outlet Size: 2-1/4 inches.
  - 8. Manufacturers:
    - a. American Standard Inc: [www.americanstandard.com](http://www.americanstandard.com).
    - b. Gerber Plumbing Fixtures LLC; Model \_\_\_\_\_: [www.gerberonline.com](http://www.gerberonline.com).
    - c. Eljer, Inc: [www.eljer.com](http://www.eljer.com).
    - d. Kohler Company: [www.kohlerco.com](http://www.kohlerco.com).
    - e. Zurn industries, Inc: [www.zurn.com](http://www.zurn.com).
    - f. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Flush Valves: ASME A112.18.1, diaphragm type, complete with vacuum breaker stops and accessories.
  - 1. Sensor-Operated Type: Solenoid operator, low voltage hard-wired, infrared sensor and over-ride push button.
  - 2. Exposed Type: Chrome plated, escutcheon, integral screwdriver stop.
  - 3. Manufacturers:
    - a. American Standard Inc; SELECTRONIC 1.28 Exposed Toilet Flush Valve: [www.americanstandard.com](http://www.americanstandard.com).
    - b. Coyne & Delany Co: [www.coynedelany.com](http://www.coynedelany.com).
    - c. Sloan Valve Company: [www.sloanvalve.com](http://www.sloanvalve.com).
    - d. Zurn Industries, Inc: [www.zurn.com](http://www.zurn.com).
    - e. \_\_\_\_\_.
    - f. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Seats:
  - 1. Manufacturers:
    - a. American Standard Inc: [www.americanstandard.com](http://www.americanstandard.com).
    - b. Beneke Magnolia; Model \_\_\_\_\_: [www.sppi.com](http://www.sppi.com).
    - c. Bemis Manufacturing Company: [www.bemismfg.com](http://www.bemismfg.com).
    - d. Church Seat Company: [www.churchseats.com](http://www.churchseats.com).
    - e. Olsonite: [www.olsonite.com](http://www.olsonite.com).
    - f. Zurn industries, Inc: [www.zurn.com](http://www.zurn.com).
    - g. Substitutions: See Section 01 60 00 - Product Requirements.

2. Solid white plastic, open front, extended back, self-sustaining hinge, brass bolts, without cover.

## 2.02 WALL HUNG URINALS

- A. Wall Hung Urinal Manufacturers:
  1. American Standard Inc: [www.americanstandard.com](http://www.americanstandard.com).
  2. Gerber Plumbing Fixtures LLC; Model \_\_\_\_\_: [www.gerberonline.com](http://www.gerberonline.com).
  3. Eljer, Inc: [www.eljer.com](http://www.eljer.com).
  4. Kohler Company; Model K-5016-ET Dexter: [www.kohlerco.com](http://www.kohlerco.com).
  5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Urinals: Vitreous china, ASME A112.19.2, wall hung with side shields and concealed carrier.
  1. Flush Volume: 0.5 gallon, maximum.
  2. Flush Style: Siphon jet.
  3. Flush Valve: Exposed (top spud).
  4. Flush Operation: Sensor operated.
  5. Trap: Integral.
  6. Removable stainless steel strainer.
- C. Flush Valves: ASME A112.18.1, diaphragm type, complete with vacuum breaker stops and accessories.
  1. Sensor-Operated Type: Solenoid operator, low voltage hard-wired, infrared sensor and over-ride push button.
  2. Exposed Type: Chrome plated, escutcheon, integral screwdriver stop.
  3. Manufacturers:
    - a. American Standard Inc: [www.americanstandard.com](http://www.americanstandard.com).
    - b. Coyne & Delany Co: [www.coynedelany.com](http://www.coynedelany.com).
    - c. Sloan Valve Company: [www.sloanvalve.com](http://www.sloanvalve.com).
    - d. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Carriers:
  1. Manufacturers:
    - a. JOSAM Company: [www.josam.com](http://www.josam.com).
    - b. Zurn Industries, Inc: [www.zurn.com](http://www.zurn.com).
    - c. Substitutions: See Section 01 60 00 - Product Requirements.
  2. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded fixture studs for fixture hanger, bearing studs.

## 2.03 LAVATORIES

- A. Lavatory Manufacturers:
  1. American Standard Inc: [www.americanstandard.com](http://www.americanstandard.com).
  2. Gerber Plumbing Fixtures LLC; Model \_\_\_\_\_: [www.gerberonline.com](http://www.gerberonline.com).
  3. Kohler Company: [www.kohler.com](http://www.kohler.com).
  4. Kohler Company; Model K-1728: [www.kohlerco.com](http://www.kohlerco.com). (LAV-1)
  5. Zurn industries, Inc: [www.zurn.com](http://www.zurn.com).
  6. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Vitreous China Wall Hung Basin: ASME A112.19.2; vitreous china wall hung lavatory, 17 by 20 inch minimum, with 4 inch high back, rectangular basin with splash lip, front overflow, and soap depression.
- C. Sensor Operated Faucet: Cast brass, chrome plated, deck mounted with sensor located on neck of spout.
  1. Spout Style: Standard.
  2. Power Supply: 24 VAC.
    - a. Cord and plug.
    - b. For 24V applications, provide transformer.
  3. Mixing Valve: None, single line for tempered water.

4. Water Supply: 3/8 inch compression connections.
5. Aerator: Vandal resistant, 0.5 GPM, laminar flow device.
6. Finish: Polished chrome.
7. Sensor Operated Faucet Manufacturers:
  - a. Advanced Modern Technologies Corporation; Model \_\_\_\_\_: [www.amtcorporation.com](http://www.amtcorporation.com).
  - b. American Standard Inc: [www.americanstandard.com](http://www.americanstandard.com).
  - c. Gerber Plumbing Fixtures LLC: [www.gerberonline.com](http://www.gerberonline.com).
  - d. The Chicago Faucet Company: [www.chicagofaucets.com](http://www.chicagofaucets.com).
  - e. Sloan Valve Company: [www.sloanvalve.com](http://www.sloanvalve.com).
  - f. Substitutions: See Section 01 60 00 - Product Requirements.

D. Accessories:

1. Chrome plated 17 gage brass P-trap with clean-out plug and arm with escutcheon.
2. Offset waste with perforated open strainer.
3. Wheel handle stops.
4. Rigid supplies.
5. Carrier:
  - a. Manufacturers:
    - 1) JOSAM Company: [www.josam.com](http://www.josam.com).
    - 2) Zurn Industries, Inc: [www.zurn.com](http://www.zurn.com).
    - 3) Substitutions: See Section 01 60 00 - Product Requirements.
  - b. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, concealed arm supports, bearing plate and studs.

## 2.04 SINKS

A. Sink Manufacturers:

1. American Standard Inc: [www.americanstandard.com](http://www.americanstandard.com).
2. Kohler Company: [www.kohlerco.com](http://www.kohlerco.com).
3. Substitutions: See Section 01 60 00 - Product Requirements.

- B. Double Compartment Bowl: ASME A112.19.3; 33 by 21 by 5.5 inch outside dimensions 20 gage thick, Type 302 stainless steel, self rimming and undercoated, with ledge back drilled for trim.

## 2.05 SHOWERS

A. Shower Manufacturers:

1. American Standard Inc; FloWise Commercial Shower System: [www.americanstandard.com](http://www.americanstandard.com).
2. Kohler Company: [www.kohlerco.com](http://www.kohlerco.com).
3. Substitutions: See Section 01 60 00 - Product Requirements.

- B. Trim: ASME A112.18.1; concealed shower supply with pressure balanced mixing valves, integral service stops, bent shower arm with adjustable spray ball joint shower head with maximum flow, and escutcheon.

C. Low-Flow Shower Head:

1. ASME A112.18.1; chrome plated vandal-proof institutional head with integral wall bracket, built-in 1.5 gpm flow control.

## 2.06 ELECTRIC WATER COOLERS

A. Electric Water Cooler Manufacturers:

1. Tri Palm International/Oasis: [www.tripalmint.com](http://www.tripalmint.com).
2. Elkay Manufacturing Company: [www.elkay.com](http://www.elkay.com).
3. Haws Corporation: [www.hawsc.com](http://www.hawsc.com).
4. Substitutions: See Section 01 60 00 - Product Requirements.
5. Water Cooler: Bi-level, barrier free, electric, self contained, mechanically refrigerated; surface mounted; stainless steel top, vinyl on steel body, elevated anti-squirt bubbler with

stream guard, automatic stream regulator, self closing controls on front and sides, mounting bracket; integral air cooled condenser .

1. Capacity: 8 gallons per minute of 50 degrees F water with inlet at 80 degrees F and room temperature of 90 degrees F, when tested in accordance with ASHRAE Std 18.
  - b. Capacity: 8 gallons per minute of 50 degree F water with inlet at 80 degree F and room temperature of 90 degree F, when tested in accordance with ASHRAE Std 18.
6. Electrical: Compressor with 6 foot cord and plug for connection to electric wiring system including grounding connector.

## **2.07 SERVICE SINKS**

- A. Service Sink Manufacturers:
  1. American Standard Inc: [www.americanstandard.com](http://www.americanstandard.com).
  2. Elkay Manufacturing Company: [www.elkay.com](http://www.elkay.com).
  3. Gerber Plumbing Fixtures LLC; Model \_\_\_\_\_: [www.gerberonline.com](http://www.gerberonline.com).
  4. Fiat; Model TSB 100: [www.cranepumbing.com](http://www.cranepumbing.com)
  5. Just Manufacturing Company: [www.justmfg.com](http://www.justmfg.com).
  6. Zurn industries, Inc: [www.zurn.com](http://www.zurn.com).
  7. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Bowl: 24 by 24 by 10 inch high white molded stone, floor mounted, with one inch wide shoulders, vinyl bumper guard, stainless steel strainer.
- C. Trim: ASME A112.18.1 exposed wall type supply with cross handles, spout wall brace, vacuum breaker, hose end spout, strainers, eccentric adjustable inlets, integral screwdriver stops with covering caps and adjustable threaded wall flanges.
- D. Accessories:
  1. 5 feet of 1/2 inch diameter plain end reinforced plastic hose.
  2. Hose clamp hanger.
  3. Mop hanger.

## **2.08 EMERGENCY EYE AND FACE WASH**

- A. Emergency Wash Manufacturers:
  1. Haws Corporation: [www.hawesco.com](http://www.hawesco.com).
  2. Therm-Omega-Tech, Inc: [www.thermomegatech.com](http://www.thermomegatech.com).
  3. Substitutions: See Section 01 60 00 - Product Requirements.
- B. ANSI Z358.1; frostproof, free standing, self-cleaning, non-clogging, combination shower and eye wash with quick opening, full-flow valves, stainless steel eye and face wash receptor, twin eye wash heads and face spray ring, stainless steel dust cover, and copper alloy control valve and fittings.

## **2.09 EMERGENCY SHOWERS**

- A. Emergency Shower Manufacturers:
  1. Haws Corporation: [www.hawesco.com](http://www.hawesco.com).
  2. Therm-Omega-Tech, Inc: [www.thermomegatech.com](http://www.thermomegatech.com).
  3. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Emergency Shower: ANSI Z358.1; free standing, self- cleaning, non-clogging 8 inch diameter stainless steel deluge shower head with elbow, one inch full flow valve with pull chain and 8 inch diameter ring, one inch interconnecting fittings.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.
- B. Verify that electric power is available and of the correct characteristics.
- C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

### **3.02 PREPARATION**

- A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

### **3.03 INSTALLATION**

- A. Install each fixture with trap, easily removable for servicing and cleaning.
- B. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.
- C. Install components level and plumb.
- D. Install and secure fixtures in place with wall carriers and bolts.
- E. Seal fixtures to wall and floor surfaces with sealant as specified in Section 07 90 05, color to match fixture.
- F. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.

### **3.04 INTERFACE WITH WORK OF OTHER SECTIONS**

- A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

### **3.05 ADJUSTING**

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

### **3.06 CLEANING**

- A. Clean plumbing fixtures and equipment.

### **3.07 PROTECTION**

- A. Protect installed products from damage due to subsequent construction operations.
- B. Do not permit use of fixtures by construction personnel.
- C. Repair or replace damaged products before Date of Substantial Completion.

**END OF SECTION**

## SECTION 23 05 13

### COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Single phase electric motors.

##### 1.02 REFERENCE STANDARDS

- A. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association; 2009, Revision 1 - 2010.
- B. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

##### 1.03 QUALITY ASSURANCE

- A. Conform to NFPA 70.

##### 1.04 DELIVERY, STORAGE, AND HANDLING

- A. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering. For extended outdoor storage, remove motors from equipment and store separately.

##### 1.05 WARRANTY

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

#### PART 2 PRODUCTS

##### 2.01 GENERAL CONSTRUCTION AND REQUIREMENTS

- A. Construction:
  - 1. Open drip-proof type except where specifically noted otherwise.
  - 2. Design for continuous operation in 40 degrees C environment.
  - 3. Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.
- B. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.
- C. Wiring Terminations:
  - 1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
  - 2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

#### PART 3 EXECUTION

##### 3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.
- C. Check line voltage and phase and ensure agreement with nameplate.

**END OF SECTION**



**SECTION 23 05 53**  
**IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Nameplates.
- B. Tags.
- C. Stencils.
- D. Pipe Markers.

**1.02 REFERENCE STANDARDS**

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; The American Society of Mechanical Engineers; 2007.
- B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2001 (Reapproved 2007).

**1.03 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.
- C. Product Data: Provide manufacturers catalog literature for each product required.
- D. Manufacturer's Installation Instructions: Indicate special procedures, and installation.
- E. Project Record Documents: Record actual locations of tagged valves.

**PART 2 PRODUCTS**

**2.01 IDENTIFICATION APPLICATIONS**

- A. Air Handling Units: Nameplates.
- B. Ductwork: Stencilled painting.
- C. Piping: Pipe markers.
- D. Thermostats: Nameplates.

**2.02 NAMEPLATES**

- A. Manufacturers:
  - 1. Advanced Graphic Engraving: [www.advancedgraphicengraving.com](http://www.advancedgraphicengraving.com).
  - 2. Kolbi Pipe Marker Co.: [www.kolbipipemarkers.com](http://www.kolbipipemarkers.com).
  - 3. Seton Identification Products: [www.seton.com](http://www.seton.com).
  - 4. Substitutions: See Section 01 60 00 - Product Requirements.
  - 5. Letter Color: White.
  - 6. Letter Height: 1/4 inch.
  - 7. Background Color: Black.
  - 8. Plastic: Conform to ASTM D709.

**2.03 TAGS**

**2.04 STENCILS**

- A. Manufacturers:
  - 1. Brady Corporation: [www.bradycorp.com](http://www.bradycorp.com).
  - 2. Kolbi Pipe Marker Co.: [www.kolbipipemarkers.com](http://www.kolbipipemarkers.com).
  - 3. Seton Identification Products: [www.seton.com](http://www.seton.com).
  - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Stencils: With clean cut symbols and letters of following size:
  - 1. Ductwork and Equipment: 2-1/2 inch high letters.

## **2.05 PIPE MARKERS**

- A. Manufacturers:
  - 1. Brady Corporation: [www.bradycorp.com](http://www.bradycorp.com).
  - 2. Kolbi Pipe Marker Co.: [www.kolbipipemarkers.com](http://www.kolbipipemarkers.com).
  - 3. MIFAB, Inc.: [www.mifab.com](http://www.mifab.com).
  - 4. Seton Identification Products: [www.seton.com](http://www.seton.com).
  - 5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Color: Conform to ASME A13.1.
- C. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

## **PART 3 EXECUTION**

### **3.01 PREPARATION**

- A. Degrease and clean surfaces to receive adhesive for identification materials.

### **3.02 INSTALLATION**

- A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.
- C. Apply stencil painting in accordance with Section 09 90 00.
- D. Install plastic pipe markers in accordance with manufacturer's instructions.
- E. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- F. Use tags on piping 3/4 inch diameter and smaller.
  - 1. Identify service, flow direction, and pressure.
  - 2. Install in clear view and align with axis of piping.
  - 3. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.
- G. Install ductwork with stencilled painting. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.

**END OF SECTION**

**SECTION 23 05 93**  
**TESTING, ADJUSTING, AND BALANCING FOR HVAC**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Testing, adjustment, and balancing of air systems.
- B. Measurement of final operating condition of HVAC systems.

**1.02 REFERENCE STANDARDS**

- A. AABC MN-1 - AABC National Standards for Total System Balance; Associated Air Balance Council; 2002.
- B. NEBB (TAB) - Procedural Standards for Testing Adjusting Balancing of Environmental Systems; National Environmental Balancing Bureau; 2005, Seventh Edition.
- C. SMACNA (TAB) - HVAC Systems Testing, Adjusting, and Balancing; Sheet Metal and Air Conditioning Contractors' National Association; 2002.

**1.03 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.
- C. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
  - 1. Submit to Multatech Architects Engineers.
  - 2. Submit six weeks prior to starting the testing, adjusting, and balancing work.
  - 3. Include at least the following in the plan:
    - a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
    - b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
    - c. Identification and types of measurement instruments to be used and their most recent calibration date.
    - d. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
    - e. Final test report forms to be used.
    - f. Procedures for formal deficiency reports, including scope, frequency and distribution.
- D. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
  - 1. Submit to the Owner representative within two weeks after completion of testing, adjusting, and balancing.
  - 2. Revise TAB plan to reflect actual procedures and submit as part of final report.
  - 3. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Multatech Architects Engineers and for inclusion in operating and maintenance manuals.
  - 4. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
  - 5. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
  - 6. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.

7. Units of Measure: Report data in I-P (inch-pound) units only.
8. Include the following on the title page of each report:
  - a. Name of Testing, Adjusting, and Balancing Agency.
  - b. Address of Testing, Adjusting, and Balancing Agency.
  - c. Telephone number of Testing, Adjusting, and Balancing Agency.
  - d. Project name.
  - e. Project location.
  - f. Project Multatech Architects Engineers.
  - g. Project Engineer.
  - h. Project Contractor.

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

## **PART 3 EXECUTION**

### **3.01 GENERAL REQUIREMENTS**

- A. Perform total system balance in accordance with one of the following:
  1. AABC MN-1, AABC National Standards for Total System Balance.
  2. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems.
  3. SMACNA HVAC Systems Testing, Adjusting, and Balancing.
  4. Maintain at least one copy of the standard to be used at project site at all times.
- B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.
- C. TAB Agency Qualifications:
  1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
  2. Having minimum of three years documented experience.
  3. Certified by one of the following:
    - a. AABC, Associated Air Balance Council: [www.aabchq.com](http://www.aabchq.com); upon completion submit AABC National Performance Guaranty.
    - b. NEBB, National Environmental Balancing Bureau: [www.nebb.org](http://www.nebb.org).
    - c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: [www.tabbcertified.org](http://www.tabbcertified.org).
- D. TAB Supervisor Qualifications: Professional Engineer licensed in Gardendale, Texas.

### **3.02 EXAMINATION**

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
  1. Systems are started and operating in a safe and normal condition.
  2. Temperature control systems are installed complete and operable.
  3. Proper thermal overload protection is in place for electrical equipment.
  4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
  5. Duct systems are clean of debris.
  6. Fans are rotating correctly.
  7. Air coil fins are cleaned and combed.
  8. Access doors are closed and duct end caps are in place.
  9. Air outlets are installed and connected.
  10. Duct system leakage is minimized.
- B. Beginning of work means acceptance of existing conditions.

### **3.03 ADJUSTMENT TOLERANCES**

- A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

- B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

### **3.04 AIR SYSTEM PROCEDURE**

- A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities .
- B. Measure air quantities at air inlets and outlets.
- C. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
- D. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.
- E. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.
- F. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

### **3.05 SCOPE**

- A. Test, adjust, and balance the following:
  - 1. Air Handling Units
  - 2. Fans
  - 3. Air Inlets and Outlets

### **3.06 MINIMUM DATA TO BE REPORTED**

- A. Air Moving Equipment:
  - 1. Location
  - 2. Manufacturer
  - 3. Model number
  - 4. Serial number
  - 5. Air flow, specified and actual
  - 6. Return air flow, specified and actual
  - 7. Outside air flow, specified and actual
  - 8. Total static pressure (total external), specified and actual
- B. Exhaust Fans:
  - 1. Location
  - 2. Manufacturer
  - 3. Model number
  - 4. Serial number
  - 5. Air flow, specified and actual
  - 6. Total static pressure (total external), specified and actual
- C. Air Distribution Tests:
  - 1. Room number/location
  - 2. Terminal type
  - 3. Terminal size
  - 4. Design air flow
  - 5. Test (final) air flow

**END OF SECTION**



**SECTION 23 07 13**  
**DUCT INSULATION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Duct insulation.
- B. Duct Liner.

**1.02 REFERENCE STANDARDS**

- A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2010.
- B. ASTM C553 - Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2008.
- C. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2010.
- D. ASTM C916 - Standard Specification for Adhesives for Duct Thermal Insulation; 1985 (Reapproved 2007).
- E. ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings; 2008.
- F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2010b.
- G. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2010.
- H. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2009.
- I. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.
- J. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association; 2005.

**1.03 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

**1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section, with minimum 3 years of experience and approved by manufacturer.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.
- B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

**1.06 FIELD CONDITIONS**

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.
- B. Maintain temperature during and after installation for minimum period of 24 hours.

## **PART 2 PRODUCTS**

### **2.01 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION**

- A. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84, NFPA 255, or UL 723.

### **2.02 GLASS FIBER, FLEXIBLE**

- A. Insulation: ASTM C553; flexible, noncombustible blanket.
  - 1. 'K' value: 0.36 at 75 degrees F, when tested in accordance with ASTM C518.
  - 2. Maximum Service Temperature: 1200 degrees F.
  - 3. Maximum Water Vapor Sorption: 5.0 percent by weight.
- B. Vapor Barrier Jacket:
  - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
  - 2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
  - 3. Secure with pressure sensitive tape.
- C. Vapor Barrier Tape:
  - 1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.
- D. Tie Wire: Annealed steel, 16 gage.

### **2.03 GLASS FIBER, RIGID**

- A. Insulation: ASTM C612; rigid, noncombustible blanket.
  - 1. 'K' value: 0.24 at 75 degrees F, when tested in accordance with ASTM C518.
  - 2. Maximum service temperature: 450 degrees F.
  - 3. Maximum Water Vapor Sorption: 5.0 percent.
  - 4. Maximum Density: 8.0 lb/cu ft.
- B. Vapor Barrier Jacket:
  - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
  - 2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
  - 3. Secure with pressure sensitive tape.
- C. Vapor Barrier Tape:
  - 1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

### **2.04 DUCT LINER**

- A. Insulation: Non-corrosive, incombustible glass fiber complying with ASTM C1071; rigid board and preformed round liner board; impregnated surface and edges coated with poly vinyl acetate polymer, acrylic polymer, or black composite.
  - 1. Fungi Resistance: ASTM G21.
  - 2. Apparent Thermal Conductivity: Maximum of 0.31 at 75 degrees F.
  - 3. Service Temperature: Up to 250 degrees F.
  - 4. Rated Velocity on Coated Air Side for Air Erosion: 5,000 fpm, minimum.
  - 5. Minimum Noise Reduction Coefficients:
    - a. 1/2 inch Thickness: 0.30.
    - b. 1 inch Thickness: 0.45.
    - c. 1-1/2 inches Thickness: 0.60.
- B. Adhesive: Waterproof, fire-retardant type, ASTM C916.
- C. Liner Fasteners: Galvanized steel, welded with press-on head.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that ducts have been tested before applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.

### **3.02 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Insulated ducts conveying air below ambient temperature:
  - 1. Provide insulation with vapor barrier jackets.
  - 2. Finish with tape and vapor barrier jacket.
  - 3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
  - 4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.
- D. Insulated ducts conveying air above ambient temperature:
  - 1. Provide with or without standard vapor barrier jacket.
  - 2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.
- E. Ducts Exposed in Mechanical Equipment Rooms or Finished Spaces (below 10 feet above finished floor): Finish with canvas jacket sized for finish painting.
- F. External Duct Insulation Application:
  - 1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
  - 2. Secure insulation without vapor barrier with staples, tape, or wires.
  - 3. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
  - 4. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
  - 5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.
- G. Duct Liner Application:
  - 1. Adhere insulation with adhesive for 100 percent coverage.
  - 2. Secure insulation with mechanical liner fasteners. Refer to SMACNA HVAC Duct Construction Standards - Metal and Flexible for spacing.
  - 3. Seal and smooth joints. Seal and coat transverse joints.
  - 4. Seal liner surface penetrations with adhesive.
  - 5. Duct dimensions indicated are net inside dimensions required for air flow. Increase duct size to allow for insulation thickness.

### **3.03 SCHEDULES**

- A. Exhaust Ducts Within 10 ft of Exterior Openings: Flexible Glass Fiber Duct Insulation, 1-inch thick
- B. Outside Air Intake Ducts: Flexible or Rigid Glass Fiber Duct Insulation, 2 inches thick.
- C. Supply Ducts: Flexible or Rigid Glass Fiber Duct Insulation, 2-inches thick.
- D. Return Ducts: Flexible or Rigid Glass Fiber Duct Insulation, 1-1/2 inches thick.
- E. Supply and Return Ducts Within 10 Feet of Air Handler: Rigid Glass Fiber Duct Liner Insulation, 1-1/2 inches thick (in lieu of external duct insulation).

**END OF SECTION**



**SECTION 23 31 00**  
**HVAC DUCTS AND CASINGS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Metal ductwork.
- B. Duct cleaning.

**1.02 REFERENCE STANDARDS**

- A. ASHRAE (FUND) - ASHRAE Handbook - Fundamentals; 2009.
- B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2008.
- C. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and General Applications; 2011a.
- D. ASTM A276 - Standard Specification for Stainless Steel Bars and Shapes; 2010.
- E. ASTM A480/A480M - Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip; 2011a.
- F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2010.
- G. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2010.
- H. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength, Low Alloy, and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2011
- I. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low Alloy, High-Strength Low-Alloy With Improved Formability, and Ultra-High Strength; 2010.
- J. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2007.
- K. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2007.
- L. ASTM C14 - Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe; 2007.
- M. ASTM C14M - Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe [Metric]; 2007.
- N. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets; 2010.
- O. ASTM C443M - Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets (Metric); 2010.
- P. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2010b.
- Q. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2009.
- R. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements; 2006.
- S. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2010.
- T. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2009.
- U. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association; 2009.
- V. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems; National Fire Protection Association; 2009.

- W. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; National Fire Protection Association; 2011.
- X. SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual; Sheet Metal and Air Conditioning Contractors' National Association; 1985, First Edition.
- Y. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association; 2005.
- Z. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

### **1.03 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate duct fittings, particulars such as gages, sizes, welds, and configuration prior to start of work for 2 pressure class and higher systems.
- C. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

### **1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum 5 years of documented experience.

### **1.05 REGULATORY REQUIREMENTS**

- A. Construct ductwork to NFPA 90A standards.

### **1.06 FIELD CONDITIONS**

- A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain temperatures within acceptable range during and after installation of duct sealants.

## **PART 2 PRODUCTS**

### **2.01 DUCT ASSEMBLIES**

- A. All Ducts: Galvanized steel, unless otherwise indicated. 2-inch pressure class, seal class A. Exposed ductwork in mechanical rooms shall be 4-inch pressure class for durability.

### **2.02 MATERIALS**

- A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.

### **2.03 DUCTWORK FABRICATION**

- A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
- B. No variation of duct configuration or size permitted except by written permission. Size round duct installed in place of rectangular ducts in accordance with ASHRAE Handbook - Fundamentals.
- C. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- D. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide single thickness turning vanes for duct widths up to 36-inches, and provide double thickness, airfoil, turning vanes for duct widths greater than 36-inches.
- E. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.

- F. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- G. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- H. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

#### **2.04 MANUFACTURED DUCTWORK AND FITTINGS**

- A. Flexible Ducts: UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound spring steel wire.
  - 1. Insulation: Fiberglass insulation with aluminized vapor barrier film.
  - 2. Pressure Rating: 10 inches WG positive and 1.0 inches WG negative.
  - 3. Maximum Velocity: 4000 fpm.
  - 4. Temperature Range: -20 degrees F to 210 degrees F.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Install, support, and seal ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- B. Install in accordance with manufacturer's instructions.
- C. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- D. Flexible Ducts: Connect to metal ducts with draw bands.
- E. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.
- F. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.
- G. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- H. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with crimp in direction of air flow.
- I. Use double nuts and lock washers on threaded rod supports.
- J. Connect diffusers or light troffer boots to low pressure ducts directly or with 5 feet maximum length of flexible duct held in place with strap or clamp.
- K. At exterior wall louvers, seal duct to louver frame and install blank-out panels.

#### **3.02 CLEANING**

- A. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment that could be harmed by excessive dirt with temporary filters, or bypass during cleaning.

**END OF SECTION**



**SECTION 23 33 00**  
**AIR DUCT ACCESSORIES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Air turning devices/extractors.
- B. Backdraft dampers - metal.
- C. Duct access doors.
- D. Duct test holes.
- E. Flexible duct connections.
- F. Volume control dampers.

**1.02 REFERENCE STANDARDS**

- A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association; 2009.
- B. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association; 2005.

**1.03 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide for shop fabricated assemblies including volume control dampers. Include electrical characteristics and connection requirements.
- C. Project Record Drawings: Record actual locations of access doors and test holes.

**1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Protect dampers from damage to operating linkages and blades.

**PART 2 PRODUCTS**

**2.01 AIR TURNING DEVICES/EXTRACTORS**

- A. Multi-blade device with blades aligned in short dimension; steel construction; with individually adjustable blades, mounting straps.

**2.02 BACKDRAFT DAMPERS - METAL**

- A. Gravity Backdraft Dampers, Size 18 x 18 inches or Smaller, Furnished with Air Moving Equipment: Air moving equipment manufacturer's standard construction.
- B. Multi-Blade, Parallel Action Gravity Balanced Backdraft Dampers: Galvanized steel, with center pivoted blades of maximum 6 inch width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

**2.03 BACKDRAFT DAMPERS - FABRIC**

- A. Fabric Backdraft Dampers: Factory-fabricated, 18 gage, galvanized steel frame.
  - 1. Blades: Neoprene coated fabric material.
  - 2. Birdscreen: 1/2 inch nominal mesh of galvanized steel or aluminum.
  - 3. Maximum Velocity: 1000 fpm (5 m/sec) face velocity.

**2.04 DUCT ACCESS DOORS**

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

## **2.05 DUCT TEST HOLES**

- A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.
- B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

## **2.06 FLEXIBLE DUCT CONNECTIONS**

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
- B. Flexible Duct Connections: Fabric crimped into metal edging strip.
  - 1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd.
    - a. Net Fabric Width: Approximately 3 inches wide.

## **2.07 VOLUME CONTROL DAMPERS**

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
- B. Splitter Dampers:
- C. Single Blade Dampers: Fabricate for duct sizes up to 6 x 30 inch.
  - 1. Fabricate for duct sizes up to 6 x 30 inch.
  - 2. Blade: 24 gage, minimum.
- D. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
  - 1. Blade: 18 gage, minimum.
- E. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.
- F. Quadrants:
  - 1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
  - 2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
  - 3. Where rod lengths exceed 30 inches provide regulator at both ends.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible. Refer to Section 23 31 00 for duct construction and pressure class.
- B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.
- C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide minimum 8 x 8 inch size for hand access, size for shoulder access, and as indicated. Provide 4 x 4 inch for balancing dampers only. Review locations prior to fabrication.
- D. Provide duct test holes where indicated and required for testing and balancing purposes.
- E. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.
- F. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment; see Section 22 05 48.

- G. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.
- H. Use splitter dampers only where indicated.
- I. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

**END OF SECTION**



**SECTION 23 34 23**  
**HVAC POWER VENTILATORS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Wall exhausters.
- B. Ceiling exhaust fans.

**1.02 REFERENCE STANDARDS**

- A. AMCA 99 - Standards Handbook; Air Movement and Control Association International, Inc.; 2010.
- B. AMCA 210 - Laboratory Methods of Testing Fans for Aerodynamic Performance Rating; Air Movement and Control Association International, Inc.; 2007 (ANSI/AMCA 210, same as ANSI/ASHRAE 51).
- C. AMCA (DIR) - [Directory of] Products Licensed Under AMCA International Certified Ratings Program; Air Movement and Control Association International, Inc.; <http://www.amca.org/licenses/search.aspx>.
- D. AMCA 300 - Reverberant Room Method for Sound Testing of Fans; Air Movement and Control Association International, Inc.; 2008.
- E. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; Air Movement and Control Association International, Inc.; 2006.
- F. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association; 2009, Revision 1 - 2010.
- G. UL 705 - Power Ventilators; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

**1.03 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels at rated capacity, and electrical characteristics and connection requirements.
- C. Manufacturer's Instructions: Indicate installation instructions.
- D. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.
- E. Maintenance Materials: Furnish the following for New Barite Plant's use in maintenance of project.
  - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
  - 2. Extra Fan Belts: One set for each individual fan.

**1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

**1.05 FIELD CONDITIONS**

- A. Permanent ventilators may not be used for ventilation during construction.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Greenheck: [www.greenheck.com](http://www.greenheck.com).
- B. Loren Cook Company: [www.lorencook.com](http://www.lorencook.com).
- C. Substitutions: See Section 01 60 00 - Product Requirements.

## **2.02 WALL EXHAUSTERS**

- A. Fan Unit: V-belt or direct driven with spun aluminum housing; resiliently mounted motor; 1/2 inch mesh, 0.062 inch thick aluminum wire bird screen.
- B. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor, and wall mounted multiple speed switch.
- C. Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked, and line voltage motor drive, power open, spring return.
- D. Sheaves: For V-belt drives, provide cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

## **2.03 CABINET AND CEILING EXHAUST FANS**

- A. Centrifugal Fan Unit: V-belt or direct driven with galvanized steel housing lined with acoustic insulation, resilient mounted motor, gravity backdraft damper in discharge.
- B. Disconnect Switch: Cord and plug in housing for thermal overload protected motor and wall mounted switch.
- C. Grille: Molded white plastic.
- D. Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheaves selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Hung Cabinet Fans:
  - 1. Install fans with resilient mountings and flexible electrical leads. Refer to Section 22 05 48.
- C. Provide sheaves required for final air balance.
- D. Install backdraft dampers on inlet to wall exhausters.
- E. Provide backdraft dampers on outlet from cabinet and ceiling exhauster fans and as indicated.

**END OF SECTION**

**SECTION 23 37 00**  
**AIR OUTLETS AND INLETS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Diffusers.
- B. Registers/grilles.
- C. Louvers.

**1.02 REFERENCE STANDARDS**

- A. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; Air Movement and Control Association International, Inc.; 2007.
- B. ASHRAE Std 70 - Method of Testing for Rating the Performance of Air Outlets and Inlets; American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc.; 2006.
- C. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association; 2005.

**1.03 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

**1.04 QUALITY ASSURANCE**

- A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.
- B. Test and rate louver performance in accordance with AMCA 500-L.

**1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Carnes Company HVAC: [www.carnes.com](http://www.carnes.com).
- B. Hart & Cooley, Inc: [www.hartandcooley.com](http://www.hartandcooley.com).
- C. Krueger: [www.krueger-hvac.com](http://www.krueger-hvac.com).
- D. Price Industries: [www.price-hvac.com](http://www.price-hvac.com).
- E. Titus: [www.titus-hvac.com](http://www.titus-hvac.com).
- F. Substitutions: See Section 01 60 00 - Product Requirements.

**2.02 RECTANGULAR CEILING DIFFUSERS**

- A. Type: Provide square, adjustable pattern, stamped and multi-core diffuser to discharge air in 360 degree, one way, two way, three way, and four way pattern with sectorizing baffles where indicated.
- B. Connections: Round.
- C. Frame: Provide lay-in ceiling type. Provide surface mounting frame in hard ceiling.
- D. Fabrication: Steel with baked enamel finish.
- E. Color: white.
- F. Accessories: Provide radial opposed blade volume control damper; removable core and sectorizing baffle with damper adjustable from diffuser face.

### **2.03 PERFORATED FACE CEILING RETURN/EXHAUST GRILLE**

- A. Type: Perforated face with fully adjustable pattern and removable face.
- B. Frame: T-bar for lay-in ceiling and surface mount for hard ceiling.
- C. Fabrication: Steel with steel frame and baked enamel finish.

### **2.04 CEILING EXHAUST AND RETURN REGISTERS/GRILLES**

#### **2.05 LOUVERS**

- A. Type: 6 inch deep with blades on 45 degree slope with center baffle and return bend, heavy channel frame, 1/2 inch square mesh bird screen over exhaust and 3/4 inch square mesh bird screen over intake.
- B. Fabrication: 16 gage thick galvanized steel welded assembly, with factory prime coat finish.
- C. Color: As shown on the drawings.
- D. Mounting: Furnish with interior flat flange for installation.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.
- C. Install diffusers to ductwork with air tight connection.
- D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.
- E. Paint ductwork visible behind air outlets and inlets matte black. Refer to Section 09 90 00.

**END OF SECTION**

**SECTION 23 81 01**  
**TERMINAL HEAT TRANSFER UNITS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Cabinet unit heaters.

**1.02 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide typical catalog of information including arrangements.
- C. Shop Drawings:
  - 1. Submit schedules of equipment and enclosures typically indicating length and number of pieces of element and enclosure, corner pieces, end caps, cap strips, access doors, pilaster covers, and comparison of specified heat required to actual heat output provided.
- D. Operation and Maintenance Data: Include manufacturers descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.
- E. Warranty: Submit manufacturer's warranty and ensure forms have been completed in New Barite Plant's name and registered with manufacturer.
- F. Maintenance Materials: Furnish the following for New Barite Plant's use in maintenance of project.
  - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
  - 2. Extra Filters: One set of each type and size.

**1.03 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

**1.04 WARRANTY**

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturers warranty for fan-coil unit.

**PART 2 PRODUCTS**

**2.01 CABINET UNIT HEATERS**

- A. Cabinet: 0.0598 inch steel with exposed corners and edges rounded, easily removed panels, glass fiber insulation and integral air outlet and inlet grilles.
- B. Finish: Factory applied baked enamel of gray color on visible surfaces of enclosure or cabinet.
- C. Fans: Centrifugal forward-curved double-width wheels, statically and dynamically balanced, direct driven.
- D. Motor: Tap wound multiple speed permanent split capacitor with sleeve bearings, resiliently mounted.
- E. Control: Integral thermostat, located in cabinet.

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install equipment exposed to finished areas after walls and ceiling are finished and painted. Do not damage equipment or finishes.
- C. Protection: Provide finished cabinet units with protective covers during balance of construction.

- D. Cabinet Unit Heaters: Install as indicated. Coordinate to assure correct recess size for recessed units.

**3.02 CLEANING**

- A. After construction is completed, including painting, clean exposed surfaces of units. Vacuum clean coils and inside of cabinets.
- B. Touch-up marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.

**END OF SECTION**

**SECTION 23 81 27**  
**SMALL SPLIT-SYSTEM HEATING AND COOLING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Air-source heat pumps.
- B. Forced air furnaces.
- C. Air cooled condensing units.
- D. Indoor air handler (fan & coil) units for duct connection.
- E. Indoor ductless fan & coil units.
- F. Controls.

**1.02 REFERENCE STANDARDS**

- A. AHRI 210/240 - Standard for Performance Rating of Unitary Air Conditioning and Air-Source Heat Pump Equipment; Air-Conditioning, Heating, and Refrigeration Institute; 2008.
- B. ARI 270 - Sound Rating of Outdoor Unitary Equipment; Air-Conditioning, Heating, and Refrigeration Institute; 1995.
- C. AHRI 520 - Performance Rating of Positive Displacement Condensing Units; Air-Conditioning, Heating, and Refrigeration Institute; 2004.
- D. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 2010 (ANSI/ASHRAE Std 15).
- E. ASHRAE Std 23 - Methods of Testing for Rating Positive Displacement Refrigerant Compressors and Condensing Units; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 2005.
- F. ASHRAE Std 52.1 - Gravimetric and Dust-Spot Procedures for Testing Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
- G. ASHRAE Std 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 2007, Including All Addenda (ANSI/AHSRAE/
- H. NEMA MG 1 - Motors and Generators; National Electrical Manufacturers Association; 2009, Revision 1 - 2010.
- I. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; National Fire Protection Association; 2009.
- J. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems; National Fire Protection Association; 2009.
- K. UL 207 - Refrigerant-Containing Components and Accessories, Nonelectrical; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

**1.03 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.
- C. Shop Drawings: Indicate assembly, required clearances, and location and size of field connections.
- D. Design Data: Indicate refrigerant pipe sizing.
- E. Manufacturer's Instructions: Indicate rigging, assembly, and installation instructions.
- F. Project Record Documents: Record actual locations of components and connections.

- G. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.
- H. Warranty: Submit manufacturers warranty and ensure forms have been filled out in New Barite Plant's name and registered with manufacturer.
- I. Maintenance Materials: Furnish the following for New Barite Plant's use in maintenance of project.
  - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
  - 2. Extra Filters: One for each unit.

#### **1.04 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum 5 years of experience and approved by manufacturer.

#### **1.05 WARRANTY**

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Carrier Corporation: [www.carrier.com](http://www.carrier.com).
- B. Trane Inc: [www.trane.com](http://www.trane.com).
- C. Daikin, US.
- D. LG.
- E. Mitsubishi.
- F. Substitutions: See Section 01 60 00 - Product Requirements.

#### **2.02 SYSTEM DESIGN**

- A. Split-System Heating and Cooling Units: Self-contained, packaged, matched factory-engineered and assembled, pre-wired indoor and outdoor units; UL listed.
  - 1. Heating and Cooling: Air-source electric heat pump located in outdoor unit with evaporator ; auxiliary electric heat.
  - 2. Provide refrigerant lines internal to units and between indoor and outdoor units, factory cleaned, dried, pressurized and sealed, with insulated suction line.
- B. Performance Requirements: See Schedule for all requirements.

#### **2.03 INDOOR UNITS FOR DUCTED SYSTEMS**

- A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heating and cooling element(s), controls, and accessories; wired for single power connection with control transformer.
  - 1. Air Flow Configuration: Upflow.
  - 2. Cabinet: Steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.
- B. Supply Fan: Centrifugal type rubber mounted with direct or belt drive with adjustable variable pitch motor pulley.
  - 1. Motor: NEMA MG 1; 1750 rpm single speed, permanently lubricated, hinge mounted.
- C. Air Filters: 1 inch thick synthetic fiber type, MERV 8 minimum, arranged for easy replacement.
- D. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
  - 1. Construction and Ratings: In accordance with AHRI 210/240 and UL listed.

2. Manufacturers: System manufacturer.

#### **2.04 INDOOR UNITS FOR DUCTLESS SYSTEMS**

- A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, evaporator coil, and controls; wired for single power connection with control transformer.
  1. Location: Ceiling or wall. Refer to drawings..
  2. Cabinet: Galvanized steel.
    - a. Finish: White.
  3. Fan: Line-flow fan direct driven by a single motor.
  4. Filter return air with washable, antioxidant pre-filter and a pleated anti-allergy enzyme filter.
- B. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.
  1. Construction and Ratings: In accordance with AHRI 210/240 and UL listed.
  2. Manufacturer: System manufacturer.
- C. Remote Actuators:

#### **2.05 OUTDOOR UNITS**

- A. Outdoor Units: Self-contained, packaged, pre-wired unit consisting of cabinet, with compressor and condenser.
  1. Comply with AHRI 210.
  2. Refrigerant: R-410A.
  3. Cabinet: Galvanized steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.
  4. Construction and Ratings: In accordance with AHRI 210/240 with testing in accordance with ASHRAE Std 23 and UL listed.
  5. Sound Rating: 69 dBA, when measured in accordance with AHRI 270.
- B. Compressor: scroll, resiliently mounted integral with condenser, with positive lubrication, crankcase heater, high pressure control, motor overload protection, service valves and drier. Provide time delay control to prevent short cycling .
- C. Air Cooled Condenser: ARI 520; Aluminum fin and copper tube coil, with direct drive axial propeller fan resiliently mounted, galvanized fan guard.
  1. Condenser Fans: Direct-drive propeller type.
  2. Condenser Fan Motor: Enclosed, 1-phase type, permanently lubricated.
- D. Coil: Air-cooled, aluminum fins bonded to copper tubes.
- E. Accessories: Filter drier, high pressure switch (manual reset), low pressure switch (automatic reset), service valves and gage ports, thermometer well (in liquid line).
  1. Provide thermostatic expansion valves.
  2. Provide heat pump reversing valves.
- F. Operating Controls:
  1. Control by room thermostat to maintain room temperature setting.
- G. Mounting Pad: 6-inch concrete pad, minimum 6 inches wider than footprint of condensing unit.

#### **2.06 ELECTRIC FURNACE COMPONENTS**

- A. Electric Heater: Helix wound bare nichrome wire heating elements arranged in incremental stages of 5 kW each, with porcelain insulators.
- B. Operating Controls:
  1. Heater stages energized in sequence with pre-determined delay between heating stages.
  2. High limit temperature control to de-energize heating elements, with automatic reset.

3. Supply fan started before electric elements are energized and continues operating after thermostat is satisfied until bonnet temperature reaches minimum setting. Include manual switch for continuous fan operation.
4. Outdoor thermostat lock-out of some heating elements until outdoor temperature drops.

## **2.07 ACCESSORY EQUIPMENT**

- A. Room Thermostat: Wall-mounted, electric solid state microcomputer based room thermostat with remote sensor to maintain temperature setting; low-voltage; with following features:
  1. System selector switch (heat-off-cool) and fan control switch (auto-on).
  2. Automatic switching from heating to cooling.
  3. Preferential rate control to minimize overshoot and deviation from setpoint.
  4. Set-up for four separate temperatures per day.
  5. Instant override of setpoint for continuous or timed period from one hour to 31 days.
  6. Short cycle protection.
  7. Programming based on weekdays, Saturday and Sunday.
  8. Selection features including degree F or degree C display, 12 or 24 hour clock, keyboard disable, remote sensor, fan on-auto.
  9. Battery replacement without program loss.
  10. Thermostat display:
    - a. Time of day.
    - b. Actual room temperature.
    - c. Programmed temperature.
    - d. System mode indication: heating, cooling, fan auto, off, and on, auto or on, off.
- B. Condensate Pump: Minimum 18-inch lift, complete with reservoir and controls.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that substrates are ready for installation of units and openings are as indicated on shop drawings.
- B. Verify that proper power supply is available and in correct location.

### **3.02 INSTALLATION**

- A. Install in accordance with manufacturer's instructions and requirements of local authorities having jurisdiction.
- B. Install in accordance with NFPA 90A and NFPA 90B.
- C. Install refrigeration systems in accordance with ASHRAE Std 15.
- D. Pipe drain from air handler to nearest floor drain.
- E. Provide condensate pump for ductless split system air handlers.

### **END OF SECTION**

**SECTION 26 05 19**  
**BUILDING WIRE AND CABLE**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Single conductor building wire.
- B. Service entrance cable.
- C. Armored cable.
- D. Metal-clad cable.
- E. Wire and cable for 600 volts and less.
- F. Wiring connectors.

**1.02 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- B. NECA 120 - Standard for Installing Armored Cable (AC) and Metal-Clad Cable (MC); National Electrical Contractors Association; 2006.
- C. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association; 2009.
- D. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

**1.03 SUBMITTALS**

- A. Product Data: Provide for each cable assembly type.
- B. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

**1.04 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.

**1.05 FIELD CONDITIONS**

- A. Products: Furnish products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

**PART 2 PRODUCTS**

**2.01 CONDUCTOR AND CABLE APPLICATIONS**

- A. Exposed Dry Interior Locations: Use only building wire in raceway.
- B. Above Accessible Ceilings: Use only building wire in raceway, armored cable, or metal clad cable.
- C. Underground Installations: Use only building wire in raceway.
- D. Use stranded conductors for control circuits.
- E. Use conductor not smaller than 12 AWG for power and lighting circuits.
- F. Use conductor not smaller than 16 AWG for control circuits or as indicated on drawings.
- G. Use 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 75 feet.
- H. Use 10 AWG conductors for 20 ampere, 277 volt branch circuits longer than 200 feet.
- I. Conductor sizes are based on copper.

**2.02 CONDUCTOR AND CABLE MANUFACTURERS**

- A. Cerro Wire LLC: [www.cerrowire.com](http://www.cerrowire.com).

- B. Industrial Wire & Cable, Inc: [www.iewc.com](http://www.iewc.com).
- C. Southwire Company: [www.southwire.com](http://www.southwire.com).

### **2.03 ALL CONDUCTORS AND CABLES**

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose indicated.
- C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- D. Comply with NEMA WC 70.
- E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- F. Insulation Temperature Rating: 75 degrees C.
- G. Conductor Material:
  - 1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
  - 2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B 787M unless otherwise indicated.
- H. Conductor Color Coding:
  - 1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
  - 2. Color Coding Method: Integrally colored insulation.
    - a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
  - 3. Color Code:
    - a. 480Y/277 V, 3 Phase, 4 Wire System:
      - 1) Phase A: Brown.
      - 2) Phase B: Orange.
      - 3) Phase C: Yellow.
      - 4) Neutral/Grounded: Gray.
    - b. 208Y/120 V, 3 Phase, 4 Wire System:
      - 1) Phase A: Black.
      - 2) Phase B: Red.
      - 3) Phase C: Blue.
      - 4) Neutral/Grounded: White.
    - c. Equipment Ground, All Systems: Green.

### **2.04 SINGLE CONDUCTOR BUILDING WIRE**

- A. Description: Single conductor insulated wire.
- B. Conductor Stranding:
  - 1. Feeders and Branch Circuits:
    - a. Size 10 AWG and Smaller: Solid.
    - b. Size 8 AWG and Larger: Stranded.
- C. Insulation Voltage Rating: 600 V.
- D. Insulation:
  - 1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
- E. Insulation: NFPA 70 , Type THHN/THWN.
- F. Insulation Temperature Rating: 75 degrees C.

## **2.05 SERVICE ENTRANCE CABLE**

- A. Service Entrance Cable for Underground Use: NFPA 70, Type USE single-conductor cable listed and labeled as complying with UL 854, Type USE-2, and with UL 44, Type RHH/RHW-2.
- B. Conductor Stranding: Stranded.
- C. Insulation Voltage Rating: 600 V.

## **2.06 ARMORED CABLE**

- A. Description: NFPA 70, Type AC cable listed and labeled as complying with UL 4, and listed for use in classified firestop systems to be used.
- B. Conductor Stranding:
  - 1. Size 10 AWG and Smaller: Solid.
  - 2. Size 8 AWG and Larger: Stranded.
- C. Insulation Voltage Rating: 600 V.
- D. Insulation: Type THHN.
- E. Grounding: Combination of interlocking armor and integral bonding wire.
- F. Armor: Steel, interlocked tape.
- G. Insulation Temperature Rating: 75 degrees C.

## **2.07 METAL-CLAD CABLE**

- A. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.
- B. Conductor Stranding:
  - 1. Size 10 AWG and Smaller: Solid.
  - 2. Size 8 AWG and Larger: Stranded.
- C. Insulation Voltage Rating: 600 V.
- D. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.
- E. Insulation Temperature Rating: 75 degrees C.
- F. Grounding: Full-size integral equipment grounding conductor.
- G. Armor: Steel, interlocked tape.
- H. Jacket: PVC ; use in locations indicated.

## **2.08 WIRING CONNECTORS**

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
- B. Compression Connectors: Provide circumferential type or hex type crimp configuration.

## **PART 3 EXECUTION**

### **3.01 PREPARATION**

- A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

### **3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install conductors and cable in a neat and workmanlike manner in accordance with NECA 1.
- C. Install armored cable (Type AC) in accordance with NECA 120.
- D. Install metal-clad cable (Type MC) in accordance with NECA 120.
- E. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
- F. Install conductors with a minimum of 12 inches of slack at each outlet.

- G. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- H. Make wiring connections using specified wiring connectors.
  - 1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
  - 2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
  - 3. Do not remove conductor strands to facilitate insertion into connector.
  - 4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
  - 5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- I. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.
- J. Insulate ends of spare conductors using vinyl insulating electrical tape.
- K. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.
- L. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.
- M. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.
- N. Support cables above accessible ceiling, using spring metal clips or metal cable ties to support cables from structure or ceiling suspension system. Do not rest cable on ceiling panels.
- O. Use split bolt connectors for copper conductor splices and taps, 6 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.
- P. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.
- Q. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

### **3.03 FIELD QUALITY CONTROL**

- A. Correct deficiencies and replace damaged or defective conductors and cables.

**END OF SECTION**

## SECTION 26 05 26

### GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Grounding and bonding components.
- B. Provide all components necessary to complete the grounding system(s) consisting of:
  - 1. Metal underground water pipe.
  - 2. Metal frame of the building.
  - 3. Concrete-encased electrode (UFER Ground).
  - 4. Rod electrodes.

##### 1.02 REFERENCE STANDARDS

- A. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association; 2009.
- B. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association; 2007.
- C. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

##### 1.03 PERFORMANCE REQUIREMENTS

- A. Grounding System Resistance: 5 ohms.

##### 1.04 SUBMITTALS

- A. Product Data: Provide for grounding electrodes and connections.
- B. Project Record Documents: Record actual locations of components and grounding electrodes.

##### 1.05 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience with service facilities within 100 miles of Project.
- C. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

#### PART 2 PRODUCTS

##### 2.01 MANUFACTURERS

- A. Cooper Power Systems, a division of Cooper Industries: [www.cooperindustries.com](http://www.cooperindustries.com).
- B. Framatome Connectors International: [www.fciconnect.com](http://www.fciconnect.com).
- C. Lightning Master Corporation: [www.lightningmaster.com](http://www.lightningmaster.com).

##### 2.02 ELECTRODES

- A. Manufacturers:
  - 1. Cooper Power Systems, a division of Cooper Industries: [www.cooperindustries.com](http://www.cooperindustries.com).
  - 2. Framatome Connectors International: [www.fciconnect.com](http://www.fciconnect.com).
  - 3. Lightning Master Corporation: [www.lightningmaster.com](http://www.lightningmaster.com).
  - 4. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Rod Electrodes: Copper-clad steel.
  - 1. Diameter: 3/4 inch.
  - 2. Length: 10 feet.
- C. Foundation Electrodes: 2/0 AWG.

### **2.03 CONNECTORS AND ACCESSORIES**

- A. Mechanical Connectors: Bronze.
- B. Exothermic Connections:
- C. Wire: Stranded copper.
- D. Grounding Electrode Conductor: Size to meet NFPA 70 requirements.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify existing conditions prior to beginning work.
- B. Verify that final backfill and compaction has been completed before driving rod electrodes.

#### **3.02 INSTALLATION**

- A. Install ground electrodes at locations indicated. Install additional rod electrodes as required to achieve specified resistance to ground.
- B. Install 4 AWG bare copper wire in foundation footing .
- C. Provide grounding electrode conductor and connect to reinforcing steel in foundation footing in at least four locations and to anchor bolts. Extend grounding conductor below grade and connect to building's grounding electrode external to concrete. . Bond steel together.
- D. Provide bonding to meet requirements described in Quality Assurance.
- E. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.
- F. For outside pad-mounted equipment install two ground rods and ground ring around the pad. Ground non-current carrying metal items by connecting them to the underground cable and grounding electrodes. Install tinned-copper conductor not less than 2 AWG for ground ring and connections to equipment. NOTE: CONTACT ELECTRIC UTILITY PROVIDER FOR ADDITIONAL GROUNDING REQUIREMENTS OF UTILITY OWNED EQUIPMENT.

#### **3.03 FIELD QUALITY CONTROL**

- A. Perform inspections and tests listed in NETA STD ATS, Section 7.13.

**END OF SECTION**

## SECTION 26 05 29

### HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Conduit and equipment supports.
- B. Anchors and fasteners.
- C. Construction Requirements for concrete bases.

##### 1.02 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- B. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

##### 1.03 SUBMITTALS

- A. Product Data: Provide manufacturer's catalog data for fastening systems.

##### 1.04 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

#### PART 2 PRODUCTS

##### 2.01 MANUFACTURERS

- A. Thomas & Betts Corporation: [www.tnb.com](http://www.tnb.com).

##### 2.02 MATERIALS

- A. Hangers, Supports, Anchors, and Fasteners - General: Corrosion-resistant materials of size and type adequate to carry the loads of equipment and conduit, including weight of wire in conduit.
- B. Supports: Fabricated of structural steel or formed steel members; galvanized.
- C. Anchors and Fasteners:
  - 1. Concrete Structural Elements: Use precast inserts, expansion anchors, or preset inserts.
  - 2. Steel Structural Elements: Use beam clamps, steel spring clips, steel ramset fasteners, or welded fasteners.
  - 3. Concrete Surfaces: Use self-drilling anchors or expansion anchors.

#### PART 3 EXECUTION

##### 3.01 INSTALLATION

- A. Install hangers and supports as required to adequately and securely support electrical system components, in a neat and workmanlike manner, as specified in NECA 1.
  - 1. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.
- B. Rigidly weld support members or use hexagon-head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.
- C. Install surface-mounted cabinets and panelboards with minimum of four anchors.
- D. In wet and damp locations use steel channel supports to stand cabinets and panelboards 1 inch off wall.
- E. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

- F. Construct concrete bases as indicated or not less than 4 inches in both directions than the supported unit and so anchors will be a minimum of 10 bolt diameters from the edge of the base. Use 3000 psi 28 day compressive strength concrete. Anchor equipment to concrete base per manufacturer's requirements. NOTE: CONTACT ELECTRIC UTILITY PROVIDER FOR PAD REQUIREMENTS OF UTILITY OWNED EQUIPMENT.

**END OF SECTION**

## SECTION 26 05 34

### CONDUIT

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Galvanized steel rigid metal conduit (RMC).
- B. Aluminum rigid metal conduit (RMC).
- C. Flexible metal conduit (FMC).
- D. Liquidtight flexible metal conduit (LFMC).
- E. Electrical metallic tubing (EMT).
- F. Rigid polyvinyl chloride (PVC) conduit.
- G. Conduit fittings.

##### 1.02 REFERENCE STANDARDS

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2005.
- B. ANSI C80.3 - American National Standard for Steel Electrical Metallic Tubing (EMT); 2005.
- C. ANSI C80.5 - American National Standard for Electrical Rigid Aluminum Conduit (ERAC); 2005.
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); National Electrical Contractors Association; 2006.
- F. NECA 102 - Standard for Installing Aluminum Rigid Metal Conduit; National Electrical Contractors Association; 2004.
- G. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; National Electrical Manufacturers Association; 2007.
- H. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; National Electrical Manufacturers Association; 2003.
- I. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; National Electrical Manufacturers Association; 2004.
- J. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

##### 1.03 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits, fittings, metallic conduit, flexible metal conduit, liquidtight flexible metal conduit, metallic tubing, nonmetallic conduit, flexible nonmetallic conduit, nonmetallic tubing, and conduit bodies.

##### 1.04 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for purpose specified and shown.

##### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.
- B. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
- C. Protect PVC conduit from sunlight.

## **PART 2 PRODUCTS**

### **2.01 CONDUIT REQUIREMENTS**

- A. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.
- B. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) or testing firm acceptable to authority having jurisdiction as suitable for the purpose indicated.
- C. Minimum Conduit Size, Unless Otherwise Indicated:
  - 1. Branch Circuit Homeruns: 3/4 inch (21 mm) trade size.
- D. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

### **2.02 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)**

- A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- B. Fittings:
  - 1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  - 2. Material: Use steel or malleable iron.
  - 3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

### **2.03 ALUMINUM RIGID METAL CONDUIT (RMC)**

- A. Description: NFPA 70, Type RMC aluminum rigid metal conduit complying with ANSI C80.5 and listed and labeled as complying with UL 6A.
- B. Fittings:
  - 1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  - 2. Material: Use aluminum.
  - 3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

### **2.04 FLEXIBLE METAL CONDUIT (FMC)**

- A. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.
- B. Fittings:
  - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  - 2. Material: Use steel or malleable iron.
- C. Description: Interlocked steel construction.

### **2.05 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)**

- A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.
- B. Fittings:
  - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  - 2. Material: Use steel or malleable iron.
- C. Description: Interlocked steel construction with PVC jacket.

### **2.06 ELECTRICAL METALLIC TUBING (EMT)**

- A. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- B. Fittings:

1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.
3. Connectors and Couplings: Use compression (gland) or set-screw type.
  - a. Do not use indenter type connectors and couplings.

## **2.07 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT**

- A. Manufacturers:
- B. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 PVC, Schedule 80 PVC where indicated on plans.
- C. Fittings:
  1. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that conditions are satisfactory for installation prior to starting work.
- B. Conduit routing is shown on drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

### **3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install conduit in a neat and workmanlike manner in accordance with NECA 1.
- C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
- D. Install aluminum rigid metal conduit (RMC) in accordance with NECA 102.
- E. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.
- F. Conduit Support:
  1. Secure and support conduits in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.
  2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
  3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
- G. Penetrations:
  1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
  2. Make penetrations perpendicular to surfaces unless otherwise indicated.
  3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
  4. Conceal bends for conduit risers emerging above ground.
  5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
  6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
  7. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.
- H. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
  1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
  2. Where conduits are subject to earth movement by settlement or frost.

- I. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
  - 1. Where conduits pass from outdoors into conditioned interior spaces.
  - 2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
- J. Provide grounding and bonding in accordance with Section 26 05 26.

**END OF SECTION**

**SECTION 26 05 35**  
**SURFACE RACEWAYS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Surface raceway systems.
- B. Wireways.
- C. Multi-outlet assemblies.

**1.02 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- B. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

**1.03 SUBMITTALS**

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets including dimensions, knockout sizes and locations, materials, fabrication details, finishes, service condition requirements, and accessories.
- B. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

**1.04 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.

**PART 2 PRODUCTS**

**2.01 SURFACE RACEWAY SYSTEMS**

- A. Manufacturers:
  - 1. Wiremold, a brand of Legrand North America, Inc: [www.legrand.us](http://www.legrand.us).

**2.02 WIREWAYS**

- A. Manufacturers:
  - 1. Schneider Electric; Square D Products: [www.schneider-electric.us](http://www.schneider-electric.us).

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install raceways in a neat and workmanlike manner in accordance with NECA 1.
- C. Install raceways plumb and level.
- D. Arrange wireways and associated raceway connections to comply with NFPA 70, including but not limited to requirements for deflected conductors and wireways used as pullboxes. Increase size of wireway where necessary.
- E. Secure and support raceways in accordance with Section 26 05 29 at intervals complying with NFPA 70 and manufacturer's requirements.
- F. Close unused raceway openings.
- G. Provide grounding and bonding in accordance with Section 26 05 26.

**END OF SECTION**



**SECTION 26 05 36**  
**CABLE TRAYS FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Cable trays and accessories.

**1.02 REFERENCES**

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2009.
- B. NEMA VE 1 - Metallic Cable Tray Systems; National Electrical Manufacturers Association; 2009.
- C. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

**1.03 SUBMITTALS**

- A. Product Data: Provide data for fittings and accessories.
- B. Shop Drawings: Indicate tray type, dimensions, support points, and finishes.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Quality Assurance. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- D. Project Record Documents: Record actual routing of cable tray and locations of supports.

**1.04 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.
- B. Products: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Schneider Electric; Square D Products: [www.schneider-electric.us](http://www.schneider-electric.us).
- B. Thomas & Betts Corporation: [www.tnb.com](http://www.tnb.com).
- C. Wiremold Company: [www.wiremold.com](http://www.wiremold.com).

**2.02 LADDER-TYPE CABLE TRAY**

- A. Description: NEMA VE 1, Class 20C ladder type tray.
- B. Material: Formed sheet steel, hot-dip galvanized after fabrication in accordance with ASTM A 123/A 123M, painted with gray epoxy.
- C. Straight Section Rung Spacing: 6 inches on center.
- D. Provide manufacturer's standard clamps, hangers, brackets, splice plates, reducer plates, blind ends, barrier strips, connectors, and grounding straps.
- E. Covers: Flanged, solid, flush cover.

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. Install metallic cable tray in accordance with NEMA VE 1.
- B. Support trays in accordance with Section 26 05 29. Provide supports at each connection point, at the end of each run, and at other points to maintain spacing between supports to support manufacturer's rated load.
- C. Use expansion connectors where required.

- D. Ground and bond cable tray under provisions of Section 26 05 26.
1. Provide continuity between tray components.
  2. Provide 2 AWG bare copper equipment grounding conductor through entire length of tray; bond to each component.
  3. Connections to tray may be made using mechanical or exothermic connectors.

**END OF SECTION**

**SECTION 26 05 37**  
**BOXES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Wall and ceiling outlet boxes.
- B. Pull and junction boxes.

**1.02 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- B. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; National Electrical Manufacturers Association; 2008.
- C. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports; National Electrical Manufacturers Association; 2008.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association; 2008.
- E. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

**1.03 SUBMITTALS**

- A. Provide manufacturer's standard catalog pages and data sheets.

**1.04 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.
- B. Products: Provide products listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Appleton Electric: [www.appletonelec.com](http://www.appletonelec.com).

**2.02 OUTLET BOXES**

- A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.
- B. Nonmetallic Outlet Boxes: NEMA OS 2.
- C. Wall Plates for Finished Areas: As specified in Section 26 27 26.

**2.03 PULL AND JUNCTION BOXES**

- A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.
- B. Hinged Enclosures: As specified in Section 26 27 16.
- C. Surface Mounted Cast Metal Box: NEMA 250, Type 4; flat-flanged, surface mounted junction box:

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. Install boxes securely, in a neat and workmanlike manner, as specified in NECA 1.
- B. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and as required by NFPA 70.
- C. Coordinate installation of outlet boxes for equipment connected under Section 26 27 17.
- D. Set wall mounted boxes at elevations to accommodate mounting heights indicated.
- E. Electrical boxes are shown on Drawings in approximate locations unless dimensioned.

- F. Orient boxes to accommodate wiring devices oriented as specified in Section 26 27 26.
- G. Maintain headroom and present neat mechanical appearance.
- H. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
- I. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.
- J. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.
- K. Do not install flush mounting box back-to-back in walls; provide minimum 6 inches separation.
  - 1. Provide minimum 24 inches separation in acoustic rated walls.
- L. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
- M. Support boxes independently of conduit, except cast box that is connected to two rigid metal conduits both supported within 12 inches of box.
- N. Use gang box where more than one device is mounted together. Do not use sectional box.
- O. Large Pull Boxes: Use hinged enclosure in interior dry locations, surface-mounted cast metal box in other locations.

### **3.02 ADJUSTING**

- A. Adjust flush-mounting outlets to make front flush with finished wall material.

**END OF SECTION**

**SECTION 26 05 53**  
**IDENTIFICATION FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Identification nameplates and labels.
- B. Wire and cable markers.
- C. Underground warning tape.

**1.02 REFERENCE STANDARDS**

- A. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

**1.03 SUBMITTALS**

- A. Product Data: Provide catalog data for nameplates, labels, and markers.

**1.04 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.

**PART 2 PRODUCTS**

**2.01 IDENTIFICATION NAMEPLATES AND LABELS**

- A. Nameplates: Engraved three-layer laminated plastic, black letters on white background.

**2.02 WIRE AND CABLE MARKERS**

- A. Locations: Each conductor at panelboard gutters, pull boxes, outlet boxes, and junction boxes each load connection.

**2.03 UNDERGROUND WARNING TAPE**

- A. Foil-backed Detectable Type Tape: 3 inches wide, with minimum thickness of 5 mil, unless otherwise required for proper detection.

**PART 3 EXECUTION**

**3.01 PREPARATION**

- A. Degrease and clean surfaces to receive nameplates and labels.

**3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install identification products centered, level, and parallel with lines of item being identified.
- C. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
- D. Install underground warning tape above buried lines with one tape per trench at 3 inches below finished grade, or as indicated on drawings.

**END OF SECTION**



## SECTION 26 05 73

### OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Performance requirements for overcurrent protective devices.
- B. Short circuit study.
- C. Coordination study and analysis.

##### 1.02 REFERENCE STANDARDS

- A. IEEE 242 - IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems; 2001.
- B. IEEE 399 - IEEE Recommended Practice for Industrial and Commercial Power Systems Analysis; 1997.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

##### 1.03 SUBMITTALS

- A. Study Preparer's Qualifications.
- B. Study Report: Submit protective device studies as specified, prior to submission of product data submittals or ordering or fabrication of protective devices.
  - 1. Include stamp or seal and signature of preparing engineer.
- C. Field Engineer Qualifications.
- D. Field Inspection Report: Show final adjusted settings of protective devices.

##### 1.04 PROTECTIVE DEVICE STUDY

- A. Analyze the specific electrical and utilization equipment (according to NEC definition), the actual protective devices to be used, and the actual feeder lengths to be installed.
  - 1. Study Methodology: Comply with requirements and recommendations of NFPA 70, IEEE 399, and IEEE 242.
  - 2. Report: State the methodology and rationale employed in making each type of calculation; identify computer software package(s) used.
- B. One-Line Diagrams: Prepare schematic drawing of electrical distribution system, with all electrical equipment and wiring to be protected by the protective devices; identify nodes on the diagrams for reference on report that includes:
  - 1. Calculated fault impedance, X/R ratios, utility contribution, and short circuit values (asymmetric and symmetric) at the main switchboard bus and all downstream devices containing protective devices.
  - 2. Breaker and fuse ratings.
  - 3. Transformer kVA and voltage ratings, percent impedance, X/R ratios, and wiring connections.
  - 4. Identification of each bus, with voltage.
  - 5. Conduit materials, feeder sizes, actual lengths, and X/R ratios.
- C. Short Circuit Study: Calculate the fault impedance to determine available 3-phase short circuit and ground fault currents at each bus and piece of equipment during normal conditions, alternate operations, emergency power conditions, and other operations that could result in maximum fault conditions.
  - 1. Show fault currents available at key points in the system down to a fault current of 7,000 A at 480 V and 208 V.
  - 2. Include motor contributions in determining the momentary and interrupting ratings of the protective devices.

3. Primary Fault Level Assumptions at Utility transformer secondary terminals: Preferred: use actual value obtained from Utility Company; if actual value not available, use data from Bussman SPD Handbook, latest edition, Impedance and Reactance Data.
  4. Report: Include all pertinent data used in calculations and for each device include:
    - a. Device identification.
    - b. Protective device.
    - c. Device rating.
    - d. Calculated short circuit current, asymmetrical and symmetrical, and ground fault current.
- D. Coordination Study: Perform an organized time-current analysis of each protective device in series from the individual device back to the primary source, under normal conditions, alternate operations, and emergency power conditions.
1. Graphically illustrate that adequate time separation exists between series devices, including upstream primary device.
  2. Plot the specific time-current characteristics of each protective device on log-log paper.
  3. Organize plots so that all upstream devices are clearly depicted on one sheet.
  4. Also show the following on curve plot sheets:
    - a. Device identification.
    - b. Voltage and current transformer ratios for curves.
    - c. 3-phase and 1-phase ANSI damage curves for each transformer.
    - d. No-damage, melting, and clearing curves for fuses.
    - e. Cable damage curves.
    - f. Transformer inrush points.
    - g. Maximum short circuit cutoff point.
    - h. Simple one-line diagram for the portion of the system that each curve plot illustrates.
    - i. Software report for each curve plot, labeled for identification.
- E. Analysis: Determine ratings and settings of protective devices to minimize damage caused by a fault and so that the protective device closest to the fault will open first.
1. Required Ratings and Settings: Derive required ratings and settings of protective devices in consideration of upstream protective device settings and optimize system to ensure selective coordination.
  2. Identify any equipment that is underrated as specified.
  3. Identify specified protective devices that will not achieve required protection or coordination and cannot be field adjusted to do so, and for which adequate devices would involve a change to the contract sum.
  4. In all cases where adequate protection or coordination cannot be achieved at no extra cost to Owner, provide a discussion of alternatives and logical compromises for best achievable coordination.
- F. Protective Device Rating and Setting Chart: Summarize in tabular format the required characteristics for each protective device based on the analysis; include:
1. Device identification.
  2. Relay CT ratios, tap, time dial, and instantaneous pickup.
  3. Circuit breaker sensor rating, long-time, short-time, and instantaneous settings, and time bands.
  4. Fuse rating and type.
  5. Ground fault pickup and time delay.
  6. Input level and expected response time at two test points that are compatible with commonly available test equipment and the ratings of the protective device.
  7. Highlight all devices that as furnished by Contractor will not achieve required protection.

## 1.05 QUALITY ASSURANCE

- A. Study Preparer Qualifications: Qualified engineer of switchgear manufacturer or approved professional engineer.

- B. Computer Software for Study Preparation: Use the latest edition of commercially available software utilizing specified methodologies.
- C. Contractor Responsibility: Provide all project-related data needed by study preparer, including equipment, wire sizes, insulation types, conduit types, and actual circuit lengths.
- D. Owner's Responsibility: Provide data on relevant Owner power distribution equipment.

## **PART 2 PRODUCTS**

### **2.01 PROTECTIVE DEVICES**

- A. Provide protective devices of ratings and settings as required so that the protective device closest to the fault will open first.
- B. In addition to requirements specified elsewhere, provide overcurrent protective devices having ratings and settings in accordance with results of this analysis.

## **PART 3 EXECUTION**

### **3.01 FIELD QUALITY CONTROL**

- A. Provide the services of a qualified field engineer and necessary tools and equipment to test, calibrate, and adjust the installed protective devices to conform to requirements determined by the coordination analysis.
- B. Adjust installed protective devices having adjustable settings to conform to requirements determined by the coordination analysis.
- C. Submit report showing final adjusted settings of all protective devices.

**END OF SECTION**



**SECTION 26 09 19**  
**ENCLOSED CONTACTORS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. General purpose contactors.
- B. Lighting contactors.

**1.02 REFERENCE STANDARDS**

- A. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC; National Electrical Manufacturers Association; 2000 (R2005).
- B. NEMA ICS 6 - Industrial Control and Systems: Enclosures; National Electrical Manufacturers Association; 1993 (R2006).
- C. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

**1.03 SUBMITTALS**

- A. Product Data: Provide dimensions, size, voltage ratings and current ratings.

**1.04 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.
- B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Schneider Electric; Square D Products: [www.schneider-electric.us](http://www.schneider-electric.us).

**2.02 GENERAL PURPOSE CONTACTORS**

- A. Description: NEMA ICS 2, AC general purpose magnetic contactor.
- B. Coil operating voltage: 120 volts, 60 Hertz.
- C. Poles: As required to match circuit configuration and control function.
- D. Enclosure: NEMA ICS 6, Type 3R.

**2.03 LIGHTING CONTACTORS**

- A. Description: NEMA ICS 2, magnetic lighting contactor.
- B. Configuration: Electrically held.
- C. Coil operating voltage: 120 volts, 60 Hertz.
- D. Poles: As required to match circuit configuration and control function.
- E. Contact Rating: Match branch circuit overcurrent protection, considering derating for continuous loads.
- F. Enclosure: NEMA ICS 6, Type 3R.
- G. Accessories:
  - 1. Selector Switch: ON/OFF/AUTOMATIC.

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. Install enclosed contactors where indicated, in accordance with manufacturer's instructions.
- B. Install enclosed contactors plumb. Provide supports in accordance with Section 26 05 29.

C. Provide engraved plastic nameplates in accordance with Section 26 05 53.

**END OF SECTION**

**SECTION 26 22 00**  
**LOW-VOLTAGE TRANSFORMERS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. General purpose transformers.
- B. K-factor transformers rated for nonlinear loads.

**1.02 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination: Coordinate the work with placement of support framing and anchors required for mounting of transformers.

**1.03 SUBMITTALS**

- A. Product Data: Include voltage, kVA, impedance, tap configurations, insulation system class and rated temperature rise, efficiency, sound level, enclosure ratings, outline and support point dimensions, weight, required clearances, service condition requirements, and installed features.

**1.04 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Schneider Electric; Square D Products: [www.schneider-electric.us](http://www.schneider-electric.us).

**2.02 ALL TRANSFORMERS**

- A. Description: Factory-assembled, dry type transformers for 60 Hz operation designed and manufactured in accordance with NEMA ST 20 and listed and labeled by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
- B. Unless noted otherwise, transformer ratings indicated are for continuous loading according to IEEE C57.96 under the following service conditions:
- C. Impregnate core and coil assembly with non-hydroscopic thermo-setting varnish to effectively seal out moisture and other contaminants.
- D. Basic Impulse Level: 10 kV.
- E. Ground core and coil assembly to enclosure by means of a visible flexible copper grounding strap.
- F. Isolate core and coil from enclosure using vibration-absorbing mounts.
- G. Nameplate: Include transformer connection data, ratings, wiring diagrams, and overload capacity based on rated winding temperature rise.
- H. Energy efficient CSL-3 compliant.

**2.03 GENERAL PURPOSE TRANSFORMERS**

- A. Description: Self-cooled, two winding transformers listed and labeled as complying with UL 506 or UL 1561; ratings as indicated on the drawings.
- B. Primary Voltage: 480 volts delta, 3 phase.
- C. Secondary Voltage: 208Y/120 volts, 3 phase.
- D. Insulation System and Allowable Average Winding Temperature Rise:
  - 1. Less than 15 kVA: Class 185 degrees C insulation system with 115 degrees C average winding temperature rise.
  - 2. 15 kVA and Larger: Class 220 degrees C insulation system with 150 degrees C average winding temperature rise.
- E. Coil Conductors: Continuous aluminum or copper windings with terminations brazed or welded.
- F. Energy Efficiency: Standard efficiency complying with NEMA TP 1.

1. Test efficiency according to NEMA TP 2.
  2. Label transformer according to NEMA TP 3.
- G. Sound Levels: Standard sound levels complying with NEMA ST 20.
- H. Mounting Provisions:
1. Less than 15 kVA: Suitable for wall mounting.
  2. 15 kVA through 75 kVA: Suitable for wall, floor, or trapeze mounting.
- I. Transformer Enclosure: Comply with NEMA ST 20.
1. Environment Type per NEMA 250: As indicated on the drawings.
  2. Construction: Heavy gage steel.
    - a. Less than 15 kVA: Totally enclosed, non-ventilated.
    - b. 15 kVA and Larger: Ventilated.
  3. Finish: Manufacturer's standard grey, suitable for outdoor installations.
  4. Provide lifting eyes or brackets.

#### **2.04 K-FACTOR TRANSFORMERS RATED FOR NONLINEAR LOADS**

- A. Description: Self-cooled, two winding transformers listed and labeled as complying with UL 1561, and designed to supply nonlinear loads to the degree designated by the UL defined K-factor; ratings as indicated on the drawings.
- B. Primary Voltage: 480 volts delta, 3 phase.
- C. Secondary Voltage: 208Y/120 volts, 3 phase.
- D. K-factor Rating: K-4, or higher.
- E. Insulation System and Allowable Average Winding Temperature Rise: Class 220 degrees C insulation system with 150 degrees C average winding temperature rise.
- F. Coil Conductors: Continuous aluminum or copper windings with terminations brazed or welded. Individually insulate secondary conductors and arrange to minimize hysteresis and eddy current losses at harmonic frequencies. Size secondary neutral conductor at twice the secondary phase conductor ampacity.
- G. Neutral Bus: Sized to accommodate twice the rated secondary current.
- H. Energy Efficiency: Standard efficiency complying with NEMA TP 1.
1. Test efficiency according to NEMA TP 2.
  2. Label transformer according to NEMA TP 3.
- I. Sound Levels: Standard sound levels complying with NEMA ST 20.
- J. Mounting Provisions:
1. Up to 75 kVA: Suitable for wall, floor, or trapeze mounting.
- K. Transformer Enclosure: Comply with NEMA ST 20.
1. Environment Type per NEMA 250: As indicated on the drawings.
  2. Construction: Heavy gage steel, ventilated.
  3. Finish: Manufacturer's standard grey, suitable for outdoor installations.
  4. Provide lifting eyes or brackets.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Perform work in a neat and workmanlike manner in accordance with NECA 1.
- B. Install transformers in accordance with manufacturer's instructions.
- C. Install transformers in accordance with NECA 409 and IEEE C57.94.
- D. Use flexible conduit, under the provisions of Section 26 05 34, 2 feet minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.
- E. Arrange equipment to provide minimum clearances as specified on transformer nameplate and in accordance with manufacturer's instructions and NFPA 70.

- F. Provide grounding and bonding in accordance with Section 26 05 26.
- G. Remove shipping braces and adjust bolts that attach the core and coil mounting bracket to the enclosure according to manufacturer's recommendations in order to reduce audible noise transmission.
- H. Where not factory-installed, install lugs sized as required for termination of conductors as shown on the drawings.

**END OF SECTION**



**SECTION 26 24 13**  
**SWITCHBOARDS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Switchboards.

**1.02 REFERENCE STANDARDS**

- A. NECA 400 - Standard for Installing and Maintaining Switchboards (ANSI); National Electrical Contractors Association; 2007.
- B. NEMA PB 2 - Deadfront Distribution Switchboards; National Electrical Manufacturers Association; 2006.
- C. NEMA PB 2.1 - General Instructions for Proper Handling, Installation, Operation, and Maintenance of Deadfront Distribution Switchboards Rated 600 Volts or Less; National Electrical Manufacturers Association; 2007
- D. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

**1.03 SUBMITTALS**

- A. Shop Drawings: Indicate front and side views of enclosures with overall dimensions shown; conduit entrance locations and requirements; nameplate legends; size and number of bus bars per phase, neutral, and ground; and switchboard instrument details.
- B. Project Record Documents: Record actual locations of switchboards.

**1.04 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.
- B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver in 48 inch maximum width shipping splits, individually wrapped for protection and mounted on shipping skids.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle in accordance with NEMA PB 2.1 and manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to switchboard internal components, enclosure, and finish.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Schneider Electric; Square D Products: [www.schneider-electric.us](http://www.schneider-electric.us).

**2.02 SWITCHBOARDS**

- A. Description: NEMA PB 2 switchboard with electrical ratings and configurations as indicated and specified.
- B. Main Section Devices: Panel mounted.
- C. Distribution Section Devices: Panel mounted.
- D. Bus Material: Copper, standard size.
- E. Bus Connections: Bolted, accessible from front for maintenance.
- F. Ground Bus: Extend length of switchboard.
- G. Molded Case Circuit Breakers: Integral thermal and instantaneous magnetic trip in each pole.

- H. Solid-State Molded Case Circuit Breakers: With electronic sensing, timing and tripping circuits for adjustable current settings; UL listed.
- I. Line and Load Terminations: Accessible from the front only of the switchboard, suitable for the conductor materials and sizes indicated.
- J. Pull Section:
- K. Future Provisions: Fully equip spaces for future devices with bussing and bus connections, suitably insulated and braced for short circuit currents. Provide continuous current rating as indicated.
- L. Enclosure: Type 1 - General Purpose, or as noted on plans.

## **PART 3 EXECUTION**

### **3.01 PREPARATION**

- A. Provide concrete housekeeping pad under the provisions of Section 03 30 00.

### **3.02 INSTALLATION**

- A. Install switchboard in locations shown on drawings, according to NEMA PB 2.1.
- B. Install in a neat and workmanlike manner, as specified in NECA 400.
- C. Tighten accessible bus connections and mechanical fasteners after placing switchboard.

**END OF SECTION**

**SECTION 26 24 16**  
**PANELBOARDS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Power distribution panelboards.
- B. Lighting and appliance panelboards.
- C. Load centers.
- D. Overcurrent protective devices for panelboards.

**1.02 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- B. NECA 407 - Standard for Installing and Maintaining Panelboards; National Electrical Contractors Association; 2009.
- C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2008.
- D. NEMA PB 1 - Panelboards; National Electrical Manufacturers Association; 2006.
- E. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; National Electrical Manufacturers Association; 2007.
- F. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

**1.03 SUBMITTALS**

- A. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
- B. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.

**1.04 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Schneider Electric; Square D Products: [www.schneider-electric.us](http://www.schneider-electric.us).

**2.02 ALL PANELBOARDS**

- A. Provide products listed and labeled by Underwriters Laboratories Inc. as suitable for the purpose indicated.
- B. Short Circuit Current Rating:
  - 1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
- C. Panelboards Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.
- D. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
  - 1. Environment Type per NEMA 250: As indicated on the drawings.
  - 2. Lockable Doors: All locks keyed alike unless otherwise indicated. Furnish two of each panelboard key.
- E. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

- F. Surge Protective Devices: Where factory-installed, internally mounted surge protective devices are provided in accordance with Section 26 43 00, list and label panelboards as a complete assembly including surge protective device.

### **2.03 POWER DISTRIBUTION PANELBOARDS**

- A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
- B. Conductor Terminations:
  - 1. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.
  - 2. Main and Neutral Lug Type: Mechanical.
- C. Bussing:
  - 1. Phase and Neutral Bus Material: Copper.
  - 2. Ground Bus Material: Copper.
- D. Circuit Breakers:
  - 1. Provide bolt-on type.
  - 2. Provide thermal magnetic circuit breakers unless otherwise indicated.
  - 3. Provide electronic trip solid state molded case circuit breakers where indicated with electronic sensing, timing, and tripping circuits for adjustable current settings UL listed where indicated on plans.
- E. Enclosures:
  - 1. Provide surface-mounted enclosures unless otherwise indicated.

### **2.04 LIGHTING AND APPLIANCE PANELBOARDS**

- A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
- B. Conductor Terminations:
  - 1. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.
  - 2. Main and Neutral Lug Type: Mechanical.
- C. Bussing:
  - 1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
  - 2. Phase and Neutral Bus Material: Copper.
  - 3. Ground Bus Material: Copper.
- D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.
- E. Enclosures:
  - 1. Provide surface-mounted or flush-mounted enclosures as indicated.
  - 2. Provide clear plastic circuit directory holder mounted on inside of door.

### **2.05 LOAD CENTERS**

- A. Description: Circuit breaker type load centers listed and labeled as complying with UL 67; ratings, configurations, and features as indicated on the drawings.
- B. Bussing:
  - 1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
  - 2. Bus Material: Copper.
- C. Circuit Breakers: Thermal magnetic plug-in type.
- D. Enclosures:
  - 1. Provide surface-mounted enclosures unless otherwise indicated.
  - 2. Provide circuit directory label on inside of door or individual circuit labels adjacent to circuit breakers.

## **2.06 OVERCURRENT PROTECTIVE DEVICES**

- A. Molded Case Circuit Breakers:
  - 1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489; ratings, configurations, and features as indicated on the drawings.
  - 2. Interrupting Capacity as indicated on drawings.
  - 3. Conductor Terminations:
    - a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
  - 4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
  - 5. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
    - a. Provide the following field-adjustable trip response settings:
      - 1) Long time delay.
      - 2) Short time pickup and delay.
      - 3) Instantaneous pickup.
      - 4) Ground fault pickup and delay where ground fault protection is indicated.
  - 6. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install panelboards securely, in a neat and workmanlike manner in accordance with NECA 1 (general workmanship), NECA 407 (panelboards), and NEMA PB 1.1.
- C. Provide required supports in accordance with Section 26 05 29.
- D. Install panelboards plumb.
- E. Provide grounding and bonding in accordance with Section 26 05 26.
- F. Install all field-installed branch devices, components, and accessories.
- G. Provide filler plates to cover unused spaces in panelboards.

**END OF SECTION**



**SECTION 26 27 01**  
**ELECTRICAL SERVICE ENTRANCE**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Metering transformer cabinets.
- B. Meter bases.

**1.02 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- B. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

**1.03 SYSTEM DESCRIPTION**

- A. System Characteristics: 480Y/277 volts, single phase, two-wire, 60 Hertz.

**1.04 SUBMITTALS**

- A. Product Data: Provide ratings and dimensions of transformer cabinets and meter bases.

**1.05 QUALITY ASSURANCE**

- A. Utility Company:
- B. Perform work in accordance with utility company written requirements and NFPA 70.
- C. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Square D: [www.squared.com](http://www.squared.com).

**2.02 COMPONENTS**

- A. Metering Transformer Cabinets: Sheet metal cabinet with hinged door, conforming to utility company requirements, with provisions for locking and sealing.
- B. Other Components: As required by utility company.

**PART 3 EXECUTION**

**3.01 PREPARATION**

- A. Arrange with utility company to obtain permanent electric service to the Project.

**3.02 INSTALLATION**

- A. Install service rack, weatherhead, transformer pad, metering transformer cabinets, and meter base as required by utility company.
- B. Install securely, in a neat and workmanlike manner, as specified in NECA 1.

**END OF SECTION**



**SECTION 26 27 17**  
**EQUIPMENT WIRING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Electrical connections to equipment.

**1.02 REFERENCE STANDARDS**

- A. NEMA WD 1 - General Color Requirements for Wiring Devices; National Electrical Manufacturers Association; 1999 (R 2005).
- B. NEMA WD 6 - Wiring Devices - Dimensional Requirements; National Electrical Manufacturers Association; 2002.
- C. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
  - 2. Determine connection locations and requirements.
- B. Sequencing:
  - 1. Install rough-in of electrical connections before installation of equipment is required.
  - 2. Make electrical connections before required start-up of equipment.

**1.04 SUBMITTALS**

- A. Product Data: Provide wiring device manufacturer's catalog information showing dimensions, configurations, and construction.

**PART 2 PRODUCTS**

**2.01 MATERIALS**

- A. Disconnect Switches: As specified in Section 26 28 18 and in individual equipment sections.
- B. Wiring Devices: As specified in Section 26 27 26.
- C. Flexible Conduit: As specified in Section 26 05 34.
- D. Wire and Cable: As specified in Section 26 05 19.
- E. Boxes: As specified in Section 26 05 37.

**2.02 EQUIPMENT CONNECTIONS**

**PART 3 EXECUTION**

**3.01 ELECTRICAL CONNECTIONS**

- A. Make electrical connections in accordance with equipment manufacturer's instructions.
- B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.
- C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.
- D. Provide receptacle outlet to accommodate connection with attachment plug.
- E. Provide cord and cap where field-supplied attachment plug is required.
- F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
- G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.

- H. Install terminal block jumpers to complete equipment wiring requirements.
- I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

**END OF SECTION**

**SECTION 26 27 26**  
**WIRING DEVICES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Wall switches.
- B. Receptacles.
- C. Wall plates.

**1.02 REFERENCE STANDARDS**

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- B. NEMA WD 1 - General Color Requirements for Wiring Devices; National Electrical Manufacturers Association; 1999 (R 2005).
- C. NEMA WD 6 - Wiring Device -- Dimensional Requirements; National Electrical Manufacturers Association; 2002 (R2008).
- D. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

**1.03 SUBMITTALS**

- A. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

**1.04 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Leviton Manufacturing Company, Inc: [www.leviton.com](http://www.leviton.com).
- B. Cooper Wiring Devices: [www.cooperwiringdevices.com](http://www.cooperwiringdevices.com)

**2.02 ALL WIRING DEVICES**

- A. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

**2.03 WALL SWITCHES**

- A. All Wall Switches: Heavy Duty, AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20; types as indicated on the drawings.
- B. Switch Type: Single pole, double pole, and 3-way.

**2.04 RECEPTACLES**

- A. All Receptacles: Heavy Duty, Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498; types as indicated on the drawings.
- B. Convenience Receptacles:
  - 1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single, duplex, or double duplex as indicated on the drawings.
- C. GFI Receptacles:
  - 1. Standard GFI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
  - 2. Weather Resistant GFI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.

## 2.05 WALL PLATES

- A. All Wall Plates: Comply with UL 514D.
  - 1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
  - 2. Size: Standard.
- B. Weatherproof Covers for Wet or Damp Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130.
- B. Coordinate locations of outlet boxes provided under Section 26 05 37 as required for installation of wiring devices provided under this section.
  - 1. Mounting Heights: Unless otherwise indicated, as follows:
    - a. Wall Switches: 48 inches above finished floor.
    - b. Receptacles: 18 inches above finished floor or 6 inches above counter.
    - c. Install telephone/data box 18 inches above finished floor.
    - d. Install telephone box for side-reach wall telephone to position top of telephone 54 inches above finished floor.
    - e. Install telephone box for forward-reach wall telephone to position top of telephone at 48 inches above finished floor.
- C. Install wiring devices in accordance with manufacturer's instructions.
- D. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.
- E. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- F. Install wiring devices plumb and level with mounting yoke held rigidly in place.
- G. Install wall switches with OFF position down.
- H. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.
- I. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings.
- J. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

**END OF SECTION**

**SECTION 26 28 13**  
**FUSES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Fuses.

**1.02 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Cooper Bussmann, a division of Cooper Industries: [www.cooperindustries.com](http://www.cooperindustries.com).

**2.02 FUSES**

- A. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose indicated.
- B. Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.
- C. Provide fuses of the same type, rating, and manufacturer within the same switch.
- D. Comply with UL 248-1.
- E. Unless otherwise indicated, provide cartridge type fuses complying with NEMA FU 1, Class and ratings as indicated.
- F. Voltage Rating: Suitable for circuit voltage.

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. Do not install fuses until circuits are ready to be energized.
- B. Install fuses with label oriented such that manufacturer, type, and size are easily read.

**END OF SECTION**



**SECTION 26 28 17**  
**ENCLOSED CIRCUIT BREAKERS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Enclosed circuit breakers.

**1.02 SUBMITTALS**

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for circuit breakers, enclosures, and other installed components and accessories.
  - 1. Include characteristic trip curves for each type and rating of circuit breaker.

**1.03 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.
- B. Products: Furnish products listed and classified by Underwriters Laboratories Inc. as suitable for purpose specified and indicated.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Schneider Electric; Square D Products: [www.schneider-electric.us](http://www.schneider-electric.us).

**2.02 ENCLOSED CIRCUIT BREAKERS**

- A. Description: Units consisting of molded case circuit breakers individually mounted in enclosures.
- B. Provide products listed and labeled by Underwriters Laboratories Inc. as suitable for the purpose indicated.
- C. Enclosed Circuit Breakers Used for Service Entrance where so applied: Listed and labeled as suitable for use as service equipment according to UL 869A.
- D. Conductor Terminations: Suitable for use with the conductors to be installed.
- E. Provide thermal magnetic circuit breakers unless otherwise indicated.
- F. Provide electronic trip circuit breakers where indicated.
- G. Provide solidly bonded equipment ground bus in each enclosed circuit breaker, with a suitable lug for terminating each equipment grounding conductor.
- H. Provide externally operable handle with means for locking in the OFF position.

**2.03 MOLDED CASE CIRCUIT BREAKERS**

- A. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489; ratings, configurations, and features as indicated on the drawings.
- B. Current Limiters: Designed for application with molded case circuit breaker. Coordinate limiter size with trip rating of circuit breaker to prevent nuisance tripping and to achieve interrupting current rating specified for circuit breaker. Provide interlocks to trip circuit breaker and to prevent closing circuit breaker when limiter compartment cover is removed or when one or more limiter is not in place or has operated.
- C. Interrupting Capacity:
  - 1. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
    - a. 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
    - b. 14,000 rms symmetrical amperes at 480 VAC.
- D. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.

- E. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
  - 1. Provide the following field-adjustable trip response settings:
    - a. Long time delay.
    - b. Short time pickup and delay.
    - c. Instantaneous pickup.
    - d. Ground fault pickup and delay where ground fault protection is indicated.
- F. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. Install enclosed circuit breakers where indicated, in accordance with manufacturer's instructions.
- B. Install enclosed circuit breakers securely, in a neat and workmanlike manner in accordance with NECA 1.
- C. Provide grounding and bonding in accordance with Section 26 05 26.

**END OF SECTION**

**SECTION 26 28 18**  
**ENCLOSED SWITCHES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Enclosed safety switches.

**1.02 SUBMITTALS**

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.

**1.03 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Schneider Electric; Square D Products: [www.schneider-electric.us](http://www.schneider-electric.us).

**2.02 ENCLOSED SAFETY SWITCHES**

- A. Description: Quick-make, quick-break, enclosed safety switches complying with NEMA KS 1, type HD (heavy duty), and listed and labeled as complying with UL 98; ratings, configurations, and features as indicated on the drawings.
- B. Provide products listed and labeled by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
- C. Short Circuit Current Rating:
  - 1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
- D. Fuse Clips for Fusible Switches designed to accommodate NEMA FU1, Class R fuses.
- E. Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.
- F. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.
- G. Enclosures: Comply with NEMA KS 1 and NEMA 250, and list and label as complying with UL 50 and UL 50E.
- H. Provide handle lockable in OFF position.

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. Install enclosed switches in accordance with manufacturer's instructions.
- B. Provide required supports in accordance with Section 26 05 29.
- C. Provide grounding and bonding in accordance with Section 26 05 26.
- D. Provide fuses complying with Section 26 28 13 for fusible switches as indicated or as required by equipment manufacturer's recommendations.
- E. Apply adhesive tag on inside door of each fused switch indicating NEMA fuse class and size installed.

**END OF SECTION**



**SECTION 26 36 00**  
**TRANSFER SWITCHES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Manual Transfer Switch.

**1.02 REFERENCE STANDARDS**

- A. NEMA ICS 10 - Industrial Control and Systems: AC Transfer Switch Equipment; National Electrical Manufacturers Association; 2005.
- B. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

**1.03 SUBMITTALS**

- A. Product Data: Provide catalog sheets showing voltage, switch size, ratings and size of switching and overcurrent protective devices, operating logic, short circuit ratings, dimensions, and enclosure details.

**1.04 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.
- B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Russelectric: [www.russelectric.com](http://www.russelectric.com).

**2.02 MANUAL TRANSFER SWITCH**

- A. Description: NEMA ICS 10, manual transfer switch .
- B. Configuration: Electrically-operated, mechanically-held transfer switch.
- C. Sequence of Operation: Switch position is selected by control switch mounted in switch cover.

**2.03 COMPONENTS**

- A. Indicating Lights: Mount in cover of enclosure to indicate NORMAL SOURCE AVAILABLE.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify that surface is suitable for transfer switch installation.

**3.02 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.

**END OF SECTION**



**SECTION 26 43 00**  
**SURGE PROTECTIVE DEVICES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Surge protective devices for service entrance locations.
- B. Surge protective devices for distribution locations.
- C. Surge protective devices for branch panelboard locations.

**1.02 SUBMITTALS**

- A. Product Data: Include detailed component information, voltage, surge current ratings, repetitive surge current capacity, voltage protection rating (VPR) for all protection modes, maximum continuous operating voltage (MCOV), nominal discharge current (I-n), short circuit current rating (SCCR), connection means including any required external overcurrent protection, enclosure ratings, outline and support point dimensions, weight, service condition requirements, and installed features.

**1.03 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Field-installed, Externally Mounted Surge Protective Devices:
  - 1. Current Technology; a brand of Thomas & Betts Power Solutions:  
[www.tnbpowersolutions.com](http://www.tnbpowersolutions.com).
  - 2. Square D.
- B. Factory-installed, Internally Mounted Surge Protective Devices:
  - 1. Same as manufacturer of equipment containing surge protective device, to provide a complete listed assembly including SPD.

**2.02 ALL SURGE PROTECTIVE DEVICES**

- A. Description: Factory-assembled surge protective devices (SPDs) for 60 Hz service, listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated; system voltage as indicated on the drawings.
- B. Protected Modes:
- C. UL 1449 Voltage Protection Ratings (VPRs):
  - 1. 208Y/120V System Voltage: Not more than 1,000 V for L-N, L-G, and N-G modes and 1,200 V for L-L mode.
  - 2. 480Y/277V System Voltage: Not more than 1,500 V for L-N, L-G, and N-G modes and 2,000 V for L-L mode.

**2.03 SURGE PROTECTIVE DEVICES FOR SERVICE ENTRANCE LOCATIONS**

- A. Unless otherwise indicated, provide field or factory installed as indicated on the drawings SPDs.
- B. List and label as complying with UL 1283 and UL 1449, Type 1.
- C. Provide SPDs utilizing field-replaceable modular or non-modular protection circuits.
- D. Surge Current Rating: Not less than 125 kA per mode/250 kA per phase.
- E. UL 1449 Nominal Discharge Current (I-n): 20 kA.
- F. UL 1449 Short Circuit Current Rating (SCCR): Not less than the available fault current at the installed location as indicated on the drawings.
- G. EMI/RFI Filtering: Provide UL 1283 EMI/RFI filter to attenuate electrical noise.
- H. Diagnostics:

1. Protection Status Monitoring: Provide indicator lights to report the protection for each phase.
- I. Provide surge rated integral disconnect switch for SPDs not connected to a dedicated circuit breaker or fused switch or not direct bus connected.

#### **2.04 SURGE PROTECTIVE DEVICES FOR DISTRIBUTION LOCATIONS**

- A. Unless otherwise indicated, provide field or factory installed as indicated on drawings. SPDs.
- B. List and label as complying with UL 1283 and UL 1449, Type 1 or Type 2.
- C. Provide SPDs utilizing field-replaceable modular or non-modular protection circuits.
- D. Surge Current Rating: Not less than 80 kA per mode/160 kA per phase.
- E. UL 1449 Nominal Discharge Current (I-n): 20 kA.
- F. UL 1449 Short Circuit Current Rating (SCCR): Not less than the available fault current at the installed location as indicated on the drawings.
- G. Diagnostics:
  1. Protection Status Monitoring: Provide indicator lights to report the protection status for each phase.
- H. Provide surge rated integral disconnect switch for SPDs not connected to a dedicated circuit breaker or fused switch or not direct bus connected.

#### **2.05 SURGE PROTECTIVE DEVICES FOR BRANCH PANELBOARD LOCATIONS**

- A. Unless otherwise indicated, provide field installed SPDs.
- B. List and label as complying with UL 1283 and UL 1449, Type 1 or Type 2.
- C. Provide SPDs utilizing field-replaceable modular or non-modular protection circuits.
- D. Surge Current Rating: Not less than 60 kA per mode/120 kA per phase.
- E. UL 1449 Nominal Discharge Current (I-n): 20 kA.
- F. UL 1449 Short Circuit Current Rating (SCCR): Not less than the available fault current at the installed location as indicated on the drawings.
- G. Diagnostics:
  1. Protection Status Monitoring: Provide indicator lights to report the protection status.
- H. Provide surge rated integral disconnect switch for SPDs not connected to a dedicated circuit breaker or fused switch or not direct bus connected.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Perform work in a neat and workmanlike manner in accordance with NECA 1.
- B. Install SPD in accordance with manufacturer's instructions.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide conductors with minimum ampacity as indicated on the drawings, as required by NFPA 70, and not less than manufacturer's recommended minimum conductor size.
- E. Install conductors between SPD and equipment terminations as short and straight as possible, not exceeding manufacturer's recommended maximum conductor length. Breaker locations may be reasonably be rearranged in order to provide leads as short and straight as possible. Twist conductors together to reduce inductance.
- F. Do not energize SPD until bonding of neutral and ground for service entrance and separately derived systems is complete in accordance with Section 26 05 26 where applicable. Replace SPDs damaged by improper or missing neutral-ground bond.

### **3.02 FIELD QUALITY CONTROL**

- A. Procure services of a qualified manufacturer's representative to observe installation and assist in inspection, testing, and adjusting. Include manufacturer's reports with field quality control submittals.

**END OF SECTION**



**SECTION 26 51 00**  
**INTERIOR LIGHTING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Interior luminaires.
- B. Emergency lighting units.
- C. Exit signs.
- D. Ballasts.
- E. Fluorescent emergency power supply units.
- F. Lamps.
- G. Luminaire accessories.

**1.02 REFERENCE STANDARDS**

- A. ANSI C82.11 - American National Standard for Lamp Ballasts - High Frequency Fluorescent Lamp Ballasts - Supplements; Consolidated-2002.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; National Electrical Contractors Association; 2010.
- C. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; National Electrical Contractors Association; 2006.
- D. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; National Electrical Contractors Association; 2006.
- E. NFPA 70 - National Electrical Code; National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures; National Fire Protection Association; 2009.

**1.03 SUBMITTALS**

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.

**1.04 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70 and NFPA 101.
- B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Cooper Lighting, a division of Cooper Industries: [www.cooperindustries.com](http://www.cooperindustries.com), or as indicated on light fixture schedule on plans.

**2.02 LUMINAIRES**

- A. Furnish products as indicated in Schedule included in the drawings.
- B. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

### **2.03 EMERGENCY LIGHTING UNITS**

- A. Furnish products as indicated in Schedule included in the drawings.

### **2.04 EXIT SIGNS**

- A. All Exit Signs: Internally illuminated with LEDs unless otherwise indicated; complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
  - 1. Number of Faces: Single or double as indicated or as required for the installed location.
  - 2. Directional Arrows: As indicated or as required for the installed location.

### **2.05 BALLASTS**

- A. Fluorescent Ballasts:
  - 1. All Fluorescent Ballasts: Unless otherwise indicated, provide high frequency electronic ballasts complying with ANSI C82.11 and listed and labeled as complying with UL 935.
  - 2. Internal Disconnect Means: Provide switch or means to de-energize ballast for service.

### **2.06 FLUORESCENT EMERGENCY POWER SUPPLY UNITS**

- A. Description: Self-contained fluorescent emergency power supply units suitable for use with indicated luminaires, complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.

### **2.07 LAMPS**

- A. Manufacturers:
  - 1. Osram Sylvania: [www.sylvania.com](http://www.sylvania.com).
- B. Color temperature 4100 degree K.

### **2.08 ACCESSORIES**

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install products according to manufacturer's instructions.
- B. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 1 (general workmanship), NECA 500 (commercial lighting), and NECA 502 (industrial lighting).
- C. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- D. Install clips to secure recessed grid-supported luminaires in place.
- E. Install wall mounted luminaires, emergency lighting units, and exit signs at height as indicated on Drawings.
- F. Connect luminaires and exit signs to branch circuit outlets provided under section 26 05 37 using flexible conduit.
- G. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions with luminaire.
- H. Bond products and metal accessories to branch circuit equipment grounding conductor.
- I. Exit Signs:
  - 1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
- J. Install specified lamps in each emergency lighting unit, exit sign, and luminaire.

### **3.02 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements, for additional requirements.
- B. Inspect each product for damage and defects.
- C. Operate each luminaire after installation and connection to verify proper operation.
- D. Test self-powered exit signs, emergency lighting units, and fluorescent emergency power supply units to verify proper operation upon loss of normal power supply.

**3.03 ADJUSTING**

- A. Aim and adjust luminaires as indicated.
- B. Position exit sign directional arrows as indicated.

**3.04 SCHEDULE - See Drawings**

**END OF SECTION**



**SECTION 26 56 00**  
**EXTERIOR LIGHTING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Exterior luminaires.
- B. Ballasts.
- C. Lamps.
- D. Poles and accessories.
- E. Luminaire accessories.

**1.02 SUBMITTALS**

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.

**1.03 QUALITY ASSURANCE**

- A. Conform to requirements of NFPA 70.
- B. Electrical Components: Underwriters Laboratories Inc. listed and classified as suitable for the purpose specified and indicated.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS AND SUPPLIERS**

- A. RLLD COMMERCIAL LIGHTING: [www.rlldesign.com](http://www.rlldesign.com)
- B. Cooper Lighting, a division of Cooper Industries: [www.cooperindustries.com](http://www.cooperindustries.com). or as indicated on schedule on drawings.

**2.02 LUMINAIRES**

- A. Provide products that comply with requirements of NFPA 70.
- B. Furnish products as indicated in Schedule included on the Drawings.
- C. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- D. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.

**2.03 BALLASTS**

- A. Fluorescent Ballasts: Suitable for lamps specified.
- B. High Intensity Discharge (HID) Ballasts: Unless otherwise indicated, provide electromagnetic ballasts complying with ANSI C82.4 and listed and labeled as complying with UL 1029.

**2.04 LAMPS**

- A. Lamp Types: As specified for each luminaire.
- B. All Lamps:
  - 1. Unless explicitly excluded, provide new, compatible, operable lamps in each luminaire.

**2.05 POLES**

- A. All Poles:
  - 1. Provide poles and associated support components suitable for the luminaire(s) and associated supports and accessories to be installed.

2. Structural Design Criteria:
  - a. Comply with AASHTO LTS.
  - b. Wind Load: Include effective projected area (EPA) of luminaire(s) and associated supports and accessories to be installed.
    - 1) Design Wind Speed: 90 miles per hour

## **2.06 ACCESSORIES**

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Install products according to manufacturer's instructions.
- B. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 1 (general workmanship) and NECA/IESNA 501 (exterior lighting).
- C. Bond products and metal accessories to branch circuit equipment grounding conductor.
- D. Install lamps in each luminaire.

#### **3.02 FIELD QUALITY CONTROL**

- A. Inspect each product for damage and defects.
- B. Operate each luminaire after installation and connection to verify proper operation.

#### **3.03 ADJUSTING**

- A. Aim and adjust luminaires to provide illumination levels and distribution as directed.

#### **3.04 CLOSEOUT ACTIVITIES**

- A. Just prior to Substantial Completion, replace all lamps that have failed.

#### **3.05 SCHEDULE - See Drawings**

**END OF SECTION**