

**PROJECT MANUAL FOR**  
**CHABOT-LAS POSITAS COMMUNITY COLLEGE DISTRICT**  
**LAS POSITAS COLLEGE**  
**PATHWAYS SUPPORT CENTER RENOVATION**

DSA APPLICATION NO. 01-122895  
LIONAKIS NO. 024003

DSA Backcheck Specifications V3

June 2, 2026

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LIONAKIS



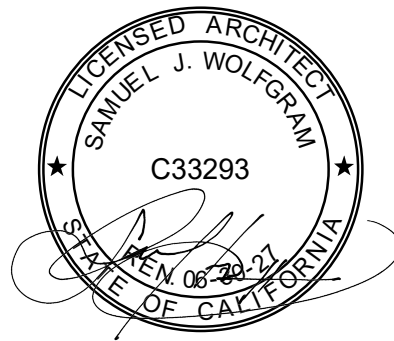
PROJECT MANUAL  
FOR  
CHABOT-LAS POSITAS COMMUNITY COLLEGE DISTRICT  
LAS POSITAS COLLEGE PATHWAYS SUPPORT CENTER RENOVATION

LIONAKIS JOB NO. 024003

DSA NO. 01-122895

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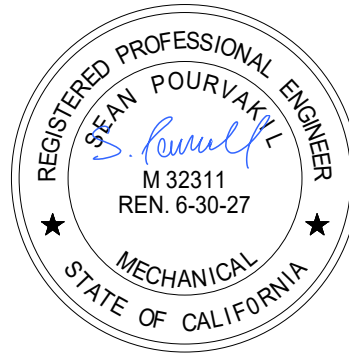
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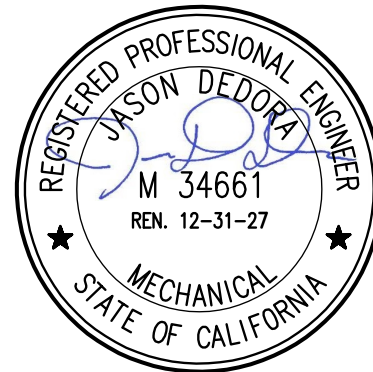


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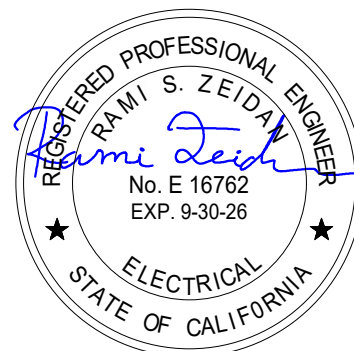


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Agency Approval:

IDENTIFICATION STAMP  
DIV. OF THE STATE ARCHITECT

APP: 01-122895 INC:

REVIEWED FOR

SS ☒ FLS ☒ ACS ☒

DATE: 06/16/2026

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PROJECT MANUAL  
FOR  
CHABOT-LAS POSITAS COMMUNITY COLLEGE DISTRICT  
LAS POSITAS COLLEGE PATHWAYS SUPPORT CENTER RENOVATION

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## SECTION 01 31 14

### ADDITIONAL REQUIREMENTS FOR DSA REVIEWED PROJECTS

#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Additional requirements for projects reviewed by the Division of the State Architect (DSA).

##### 1.2 RELATED SECTIONS

- A. Section 01 70 00 – Execution and Closeout Requirements: Project closeout requirements.

##### 1.3 REFERENCES

- A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only.
- B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.
- C. California Code of Regulations (CCR).
  - 1. Title 8, Division 1, Chapter 3.2 – California Occupational Safety and Health Regulations (Cal/OSHA).
  - 2. Title 8, Division 1, Chapter 4, Sub-Chapter 4 – Construction Safety Orders.
  - 3. Title 8, Division 1, Chapter 4, Sub-Chapter 7 – General Industry Safety Orders.
  - 4. Title 19, Division 1 – State Fire Marshal (SFM).
  - 5. California Code of Regulations, Title 24, Part 1 - California Administrative Code.
    - a. All Code Section numbers in this Section refer to Chapter 4 “Administrative Regulations for the Division of the State Architect – Structural Safety”, Group 1 “Safety of Construction of Public Schools”.
- D. Division of the State Architect Interpretation of Regulations Manual (DSA IR).
  - 1. DSA IR A-6 – Construction Change Document Submittal and Approval Process.
  - 2. DSA IR A-7 – Project Inspector Certification and Approval.
  - 3. DSA IR A-8 – Project Inspector and Assistant Inspector Duties and Performance.
  - 4. DSA IR A-12 – Assistant Inspector Approval.
- E. Division of the State Architect Website: [www.dsa.dgs.ca.gov](http://www.dsa.dgs.ca.gov).

##### 1.4 GENERAL REQUIREMENTS

- A. Contractor’s Duties:
  - 1. Comply with California Administrative Code, Chapter 4, Article 6, Paragraph 4-343, “Duties of the Contractor” in addition to the duties described in the Contract Documents.
  - 2. Comply with CCR Title 8, Division 1, Chapter 3.2, California Occupational Safety and Health Regulations (Cal/OSHA).

3. Comply with CCR Title 8, Division 1, Chapter 4, Sub-Chapter 4, Construction Safety Orders.
4. Comply with requirements of CCR Title 19, Division 1, State Fire Marshal (SFM).
- B. Architect's and Architect's Consultants' Duties: Comply with requirements of California Administrative Code, Chapter 4, Article 6, Paragraph 4-341, "Duties of the Architect, Structural Engineer or Professional Engineer" and Paragraph 4-344, "Duties of Mechanical and Electrical Engineers", in addition to the duties described in the Contract Documents.
- C. Arbitration: DSA is not subject to arbitration proceedings.
- D. Should any existing conditions such as deterioration or non-complying construction be discovered which is not covered by the DSA approved documents wherein the finished work will not comply with Title 24, California Code of Regulations (CCR), a Construction Change Document (CCD), or a separate set of Drawings and Specifications, detailing and specifying the required repair work shall be submitted to and approved by DSA before proceeding with the repair work.

#### 1.5 REGULATORY REQUIREMENTS

- A. Perform all work in accordance with applicable laws, codes, ordinances, rules, and regulations including, without limitation, 2025 California Building Code (CBC) Parts 1 through 5 - 6 Part 9, and Part 12 in accordance with Title 24, Part 1, 4-305. Maintain a copy of these documents at the project site at all times.
- B. Codes adopted by the City, County, State, and Federal agencies govern minimum project requirements. Comply with the latest edition of applicable regulatory requirements and standards unless otherwise indicated or specified.
- C. Work as described in Drawings and Specifications shall not be construed as to permit work not in accordance with applicable laws, codes, ordinances, rules, and regulations.

#### 1.6 INSPECTION AND SUPERVISION

- A. Supervision by DSA shall be in accordance with California Administrative Code, Chapter 4, Article 5, Paragraph 4-334.
- B. Owner shall select and pay for the services of a Project Inspector, certified and approved by the Architect, the Structural Engineer (when applicable), and DSA in accordance with Title 24, Part 1, 4-333(b).
  1. When required, Owner will select and pay for the services of additional full-time Assistant Project Inspector(s) certified and approved by DSA in accordance with DSA IR A-12.
- C. Project Inspector shall have and maintain on the job at all times, the edition of CCR Title 24, Part 1 through Part 6 referred to in the Drawings and Project Manual per Title 24, Part 1, 4-342(b)3.
- D. Project Inspector shall inspect construction in accordance with California Administrative Code, Chapter 4, Article 5, Paragraph 4-333(b), "Inspection by a Project Inspector", and Article 6, Paragraph 4-342, "Duties of the Project Inspector", and DSA IR A-8.
  1. Project Inspector performance rating by DSA shall be in accordance with DSA IR A-8, Section 3.1, "Project Inspector Performance Review".

- E. Reports: Project Inspector shall submit the following:
  - 1. Semi-Monthly Reports: Comply with California Administrative Code, Chapter 4, Article 5, Paragraph 4-337.
  - 2. Verified Reports: Comply with California Administrative Code, Chapter 4, Article 5, Paragraph 4-336.
- F. Special Inspection Requirements:
  - 1. Comply with California Administrative Code, Chapter 4, Article 5, Paragraph 4-333(c), "Special Inspection".
  - 2. Special inspection costs to be paid by Owner.
  - 3. Conduct special inspection in accordance with DSA-103, Statement of Structural Tests and Inspections.

#### 1.7 TESTING AGENCY REQUIREMENTS

- A. Comply with California Administrative Code, Chapter 4, Article 5, Paragraph 4-335, "Structural Tests and Special Inspections".
- B. Owner will select and pay for the services of a Testing Lab, certified and approved by the Architect, the Structural Engineer (when applicable), and DSA in accordance with Title 24, Part 1, 4-333(b).
- C. Sampling and testing shall be performed by properly qualified persons in accordance with applicable American Society for Testing and Materials (ASTM) standards.
- D. Conduct tests in accordance with DSA-103, Statement of Structural Tests and Inspections.
- E. Submit 1 copy of test reports to DSA.

#### 1.8 SUBSTITUTIONS AND REQUESTS FOR INFORMATION

- A. Substitutions and Requests for Information (RFIs) that affect structural safety, fire and life safety, access compliance, or energy (as applicable) are Construction Change Documents and shall be submitted to DSA for review and approval prior to fabrication and installation on the project.

#### 1.9 ADDENDA AND CONSTRUCTION CHANGES

- A. Comply with California Administrative Code, Chapter 4, Article 5, Paragraph 4-338, "Addenda and Construction Changes".
  - 1. Addenda and Construction Changes, including supplementary drawings when applicable, shall be signed and stamped by the Architect and approved by DSA in accordance with Title 24, Part 1, 4-338(b).
- B. Comply with DSA IR A-6.
- C. Obtain DSA approval for changes to DSA approved Drawings and Specifications which affect Code-regulated construction and inspection/testing functions prior to start of that Work. Code-regulated construction refers to Work that is regulated by Code provisions applicable to public school construction, including those adopted by Division of the State Architect-Structural Safety Section (DSA/SS), Division of the State Architect-Access Compliance Section (DSA/AC), and Division of the State Architect-Fire and Life Safety Section (DSA/FLS).

1. All changes, substitutions, and Requests for Information (RFIs) that affect Structural Safety, Fire and Life Safety, Access Compliance, or Energy, as applicable, shall be submitted to DSA for review and approval as a Construction Change Document (CCD) prior to fabrication and installation of the Work in accordance with DSA IR A-6 and Title 24, Part 1, 4-338(c). Substitutions shall be for any material, system, or product that would otherwise be regulated by DSA.
- D. Changes can be approved by DSA through the CCD Category A or the CCD Category B review process, as applicable. Comply with DSA IR A-6, Article 3, Section 3.1, "CCD Category A" and DSA IR A-6, Article 3, Section 3.2, "CCD Category B".
  1. CCD Category A is defined as changes to or affecting the Structural, Access, or Fire-Life safety portions of the Project.
  2. CCD Category B is defined as changes not affecting the Structural, Access, or Fire-Life safety portions of the Project.
  3. Construction Change Documents (Section 4-338(c)) must be signed by all of the following: A/E of Record, Structural Engineer (when applicable), Delegated Professional Engineer (when applicable), and DSA.
- E. Do not begin any work under addendum or construction changes until required DSA written approval is obtained.

## PART 2 PRODUCTS

Not Used

## PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 33 00  
SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Submittal procedures.
- B. Contractor's construction progress schedules.
- C. Shop drawings.
- D. Proposed products list.
- E. Product data.
- F. Samples.
- G. Design Data.
- H. Test Reports.
- I. Manufacturers' instructions.
- J. Manufacturer's field reports.
- K. Manufacturers' certificates.

1.2 RELATED SECTIONS

- A. Section 01 60 00 – Product Requirements: Substitutions.
- B. Section 01 70 00 – Execution and Closeout Requirements; for Contract warranties and manufacturer's certificates closeout submittals.

1.3 SUBMITTAL PROCEDURES

- A. Electronic File Availability:
  - 1. Architect's electronic drawing files for this project will be available to Contractor upon written request. The request shall include the drawing sheet number of each drawing being requested. Architect shall respond to the written request using the Delivery of Electronic Files Agreement Form attached at the end of this Section. Contractor shall sign and date the form and return it to Architect prior to the electronic files being delivered to Contractor.
    - a. Electronic drawing files developed by Architect's Consultants for this project may be available under separate agreement with each consultant. Refer to the directory on the Title/Cover Drawing Sheet for listing of consultant information.
  - 2. Architect's Building Information Model (BIM) for this project will be available to Contractor upon written request. Architect shall respond to the written request using the Delivery of BIM Agreement Form attached at the end of this Section. Contractor shall sign and date the form, return it to Architect prior to the BIM files being delivered to Contractor.
- B. All submittals shall be provided in electronic format using software acceptable to Architect.
- C. Transmit each submittal with a Submittal Form acceptable to Architect. Limit each transmittal to a single submittal item or series of related items.

- D. Sequentially number the transmittal forms. Resubmittals shall retain original number with an alphabetic suffix.
- E. Identify Project, Contractor, Subcontractor or Supplier; pertinent Drawing sheet and detail number(s), and Specification Section number, as appropriate.
- F. Apply Contractor's stamp, signed or initialed certifying that review, verification of products required, field dimensions, adjacent construction Work, and coordination of information, is in accordance with the requirements of the Work and the Contract Documents.
- G. Schedule submittals in accordance with construction to expedite the Project, and deliver to Architect at business address. Coordinate submission of related items.
- H. Unless otherwise agreed upon in advance, all submittals required within any one specification Section shall be submitted at the same time, in a single package.
- I. Identify variations from the Contract Documents and product or system limitations which may be detrimental to successful performance of the completed Work.
- J. Revise and resubmit submittals as required, identify all changes made since previous submittal; re-submit within such time as necessary to avoid delay to the Work of the re-submitted item, related Work, and the Project.
- K. Acceptance of submittals by Architect is general in nature and shall not relieve Contractor from responsibility for proper fitting and construction of work, nor from furnishing products, materials, and work required by Contract which may not be indicated on submittals.
- L. No portion of Work requiring submittals shall be commenced until submittal has been reviewed and accepted by Architect. All such portions of Work shall be in accordance with accepted submittals.
- M. Distribute Architect reviewed submittals electronically to concerned parties. Instruct parties to promptly report any inability to comply with provisions.
- N. Submit requests for substitution under provisions of Section 01 60 00.

#### 1.4 CONTRACTOR'S CONSTRUCTION PROGRESS SCHEDULE

- A. Within 30 days after the Notice to Proceed submit a fully developed, Contractor's Construction Progress Schedule which meets the following minimum criteria:
  - 1. Submit a computer-generated schedule generated using Primavera P6 or equivalent CPM scheduling software, with a separate timeline for each significant construction activity.
    - a. Equivalency of a proposed substitute CPM scheduling software shall be determined by the Architect at their sole discretion at Contractor's request.
  - 2. Critical Path Management (CPM) Network Definition: CPM network is a graphic description of the construction plan, showing the sequential steps needed to reach the completion of the Work. It shall depict events and tasks, and their interrelationships, and shall recognize the progress that must be made in one task before subsequent tasks can begin. The CPM network shall be comprehensive and shall include all interdependencies and interactions required to perform the Work of the Project. The only activity in the schedule that will not have a predecessor is the Project Start or Notice to Proceed Milestone. The only activity in the schedule that will not have a successor is the Project Completion Milestone. All other activities in the schedule shall have predecessor and successor logic ties.

3. Contractor shall submit the schedule in Portable Document Format (PDF). Contractor shall also submit an electronic copy of the data used to produce the PDF submittal in a format compatible with Primavera P6, unless an equivalent CPM scheduling software has been accepted by Architect.
  4. Coordinate each element on the schedule with other construction activities; include minor elements involved in the sequence of the Work. Show each activity in proper sequence. Indicate graphically sequences necessary for completion of related portions of the Work. Indicate early/late start, early/late finish, float dates, and duration.
  5. Coordinate Contractor's Construction Progress Schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests and other schedules. Indicate submittal dates on the schedule for shop drawings, product data, samples, and product delivery dates.
  6. Schedule shall allow time for Project closeout procedures.
  7. Indicate Final Completion date on Progress Schedule.
    - a. Construction Progress Schedule Final Completion date shall be the same as contractual completion date. If dates differ, Construction Progress Schedule will be returned without review.
- B. Work Stages: Indicate important stages of construction for each major portion of the Work, including testing and installation.
- C. In the event the contractor submits a viable, contractually compliant construction schedule which indicates project completion at a date earlier than the contractually provided contract duration, the acceptance of such a schedule will not change the contract time. In such an event, a schedule activity entitled project float, of a duration equal to the difference between the proposed construction duration and the contract duration, will be added to the schedule. All project float is a project resource for the Contractor and the Owner, and is not for the exclusive use of either party.
- D. Area Separations: Provide a separate time bar to identify each major construction area for each major portion of the Work. Indicate where each element in an area shall be sequenced or integrated with other activities.
- E. Cost Correlation: At the head of the Schedule, provide a two item cost correlation line, indicating precalculated and actual costs. On the line show dollar-volume of Work performed as of the dates used for preparation of payment requests.
- F. Initial Schedule will be reviewed by Architect and Owner solely to ensure compliance with the Contract Documents. Architect's response to Contractor will indicate acceptance if the Schedule complies with the Contract Documents, or non-acceptance if it does not comply with the Contract Documents.
- G. Distribution: After Architect's review of entire Construction Progress Schedule, distribute the schedule electronically to Architect, Owner, subcontractors, and other parties required to comply with scheduled dates. Post copies in the Project meeting room and temporary field office.
  1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.
- H. Revisions to the Construction Progress Schedule shall be as follows:
  1. Contractor shall not revise the contractual completion date without an executed Change Order.

2. All revisions shall accurately reflect the Record Schedule as of date of revision.
  3. Revise the schedule after each meeting or activity where revisions have been recognized or made. Issue the revised schedule concurrently with the minutes of each meeting. A combined 3 week Look-Ahead Schedule with a 1 week Record Schedule for the previous week shall be submitted by Contractor to Owner and Architect for review at each progress meeting. The Contractor shall status the schedule on a weekly basis. This Look-Ahead Schedule shall be derived from this weekly statusing. The cumulative status of the Look-Ahead schedules shall be the basis for the Monthly Update submittal. In no event shall the Contractor utilize a separate schedule for generation and maintenance of the Look-Ahead schedules. If the superintendent's and revised Baseline Schedule schedule's logic deviate significantly, a reconciliation of the 2 schedules shall be required.
  4. Revise the Schedule at the time of each Application for Payment, and clearly identify changes from the previous version. Submit the revised Schedule with the Applications for Payment. Payments are conditional upon Contractor providing the updated schedule.
- I. No more than 20 percent of the total number of activities shown on the schedule shall be critical or near critical. Near critical is defined as float less than 10 days.
  - J. As a condition precedent to final acceptance of the Project, submit a final Record Construction Schedule and all final reports which accurately reflect the manner in which the Project was constructed and includes actual start and completion dates for all work activities on the Baseline Schedule.

#### 1.5 SHOP DRAWINGS

- A. Shop Drawings: Submit to Architect for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.
- B. Shop drawings that are copies of the Contract Document drawings are not allowed.
- C. Provide shop drawings to scale showing all details of proposed construction. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- D. When required by individual specification Sections, provide shop drawings signed and sealed by professional engineer responsible for designing components shown on shop drawings.
  1. Include signed and sealed calculations to support design.
  2. Submit drawings and calculations in form suitable for submission to and approval by authorities having jurisdiction.
  3. Make revisions and provide additional information when required by authorities having jurisdiction.
- E. Submit shop drawings in electronic format.
  1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
  2. Name file with submittal number or other unique identifier, including revision identifier.
- F. After review and acceptance by Architect, Contractor shall distribute electronically to concerned parties and provide copies for Record Documents described in Section 01 70 00.

## 1.6 PROPOSED PRODUCTS LIST

- A. Within 15 days after the date of the Owner-Contractor Agreement, submit complete list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
- B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

## 1.7 PRODUCT DATA

- A. Product Data: Submit to Architect for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.
- B. Submit product data as required by individual Specification Sections.
- C. Submit product data in electronic format.
  - 1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
  - 2. Name file with submittal number or other unique identifier, including revision identifier.
- D. Mark each submittal to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information unique to this Project.
- E. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- F. After review and acceptance by Architect, Contractor shall distribute electronically to concerned parties and provide copies for Record Documents described in Section 01 70 00.
- G. Maintain a copy of all Material and Safety Data Sheets (MSDS) at the jobsite at all times, and be ready to furnish MSDS upon request or have ready access to MSDS in emergencies.

## 1.8 SAMPLES

- A. Samples: Submit to Architect for review for limited purpose of checking for conformance with information given and design concept expressed in Contract Documents.
- B. Submit samples to illustrate functional and aesthetic characteristics of products, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
- C. Submit samples of finishes from the full range of manufacturers' standard colors, textures, and patterns for Architect's selection.
- D. Include identification on each sample, with complete product information.
- E. Submit the number of samples specified in individual specification Sections plus 1 additional sample which will be retained by Architect. Provide a minimum of 2 samples.
- F. Reviewed samples which may be used in the Work are indicated in individual specification Sections.
- G. Samples will not be used for testing purposes unless specifically stated in specification Section.

1.9 DESIGN DATA

- A. Submit for Architect's knowledge as contract administrator or for Owner.
- B. Submit for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

1.10 TEST REPORTS

- A. Submit for Architect's knowledge as contract administrator or for Owner.
- B. Submit test reports for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

1.11 MANUFACTURER'S INSTRUCTIONS

- A. When specified in individual specification Sections, submit manufacturers' written instructions for delivery, storage, assembly, installation, adjusting, and finishing, in quantities specified for Product Data.
- B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
- C. Identify conflicts between manufacturers' written instructions and the Contract Documents.

1.12 MANUFACTURER'S FIELD REPORTS

- A. Submit reports for Architect's benefit as contract administrator or for Owner.
- B. Submit report within 3 days of observation to Architect for information.
- C. Submit for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.

1.13 MANUFACTURER'S CERTIFICATES

- A. When specified in individual specification Sections, submit manufacturers' certificate to Architect for review, in quantities specified for Product Data.
- B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications, as appropriate.
- C. Certificates may be based on recent or previous test results of materials or products, and shall be acceptable to Architect.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

## **DELIVERY OF ELECTRONIC FILES AGREEMENT FORM**

Date: \_\_\_\_\_

Recipient's Name: \_\_\_\_\_

Recipient's Address: \_\_\_\_\_

Project: \_\_\_\_\_

At your request, Lionakis will provide Architectural and/or Engineering electronic files of the images depicted on each drawing sheet for your convenience and use in the preparation of shop drawings related to \_\_\_\_\_, subject to the following terms and conditions:

Lionakis makes no representation as to the compatibility of electronic files with your hardware or your software.

Data contained in these electronic files are part of our instruments of service and shall not be used by you or anyone else receiving these data through or from you for any purpose other than as a convenience in the preparation of shop drawings for the referenced project. Any other use or reuse by you or by others will be at your sole risk and without liability or legal exposure to Lionakis. You agree to make no claim and hereby waive, to the fullest extent permitted by law, any claim or cause of action of any nature against Lionakis, Lionakis' officers, directors, employees, agents or sub-consultants that may arise out of or in connection with your use of the electronic files.

Furthermore, you shall, to the fullest extent permitted by law, indemnify and hold Lionakis harmless against all damages, liabilities or costs, including reasonable attorney's fees and defense costs, arising out of or resulting from your use of these electronic files.

These electronic files are not construction documents. Differences may exist between these electronic files and corresponding hard-copy construction, as-built, or record documents. Lionakis makes no representation regarding the accuracy or completeness of the electronic files you receive. In the event that a conflict arises between the signed and sealed hard-copy construction documents prepared by Lionakis and the electronic files, the signed and sealed hard-copy construction documents shall govern.

You are responsible for determining if any conflict exists. By your use of these electronic files, you are not relieved of your duty to fully comply with the Contract Documents, including, but not limited to, the need to check, confirm and coordinate all dimensions and details, take field measurements, verify field conditions and coordinate your work with the work of others for the project.

Because information presented in the electronic files can be modified, unintentionally or otherwise, Lionakis reserves the right to remove all indications of ownership and/or involvement from each electronic file.

Lionakis will furnish you electronic files of the following Architectural and/or Engineering drawing sheets:

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Under no circumstances shall delivery of the electronic files for use by you be deemed a sale by Lionakis, and Lionakis makes no warranties, either express or implied, of merchantability and fitness for any particular purpose. In no event shall Lionakis be liable for any loss of profit or any consequential damages as a result of your use or reuse of these electronic files.

Electronic files will be sent to you after signed acknowledgement of this letter is received by Lionakis.

Accepted By:

Recipient: \_\_\_\_\_

Company: \_\_\_\_\_

Address: \_\_\_\_\_

City, State, ZIP: \_\_\_\_\_

Recipient's Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Printed Name: \_\_\_\_\_

Title: \_\_\_\_\_

## **DELIVERY OF BIM AGREEMENT FORM**

Date: \_\_\_\_\_

Recipient's Name: \_\_\_\_\_

Recipient's Address: \_\_\_\_\_

Project: \_\_\_\_\_

At your request, Lionakis will provide the Building Information Model (BIM) for your convenience and use related to the Project, subject to the following terms and conditions:

Lionakis makes no representation as to the compatibility of the BIM with your hardware or your software beyond the specified release of the applicable software.

Data contained in the BIM is part of our instruments of service and shall not be used by you or anyone else receiving this data through or from you for any purpose other than as a convenience. Any other use or reuse by you or by others will be at your sole risk and without liability or legal exposure to Lionakis. You agree to make no claim and hereby waive, to the fullest extent permitted by law, any claim or cause of action of any nature against Lionakis, Lionakis' officers, directors, employees, agents or sub-consultants that may arise out of or in connection with your use of the BIM.

Furthermore, you shall, to the fullest extent permitted by law, indemnify and hold Lionakis harmless against all damages, liabilities or costs, including reasonable attorney's fees and defense costs, arising out of or resulting from your use of the BIM.

This BIM is not a construction document. Differences may exist between the BIM and corresponding hard-copy construction documents, as-built documents, or record documents. Lionakis makes no representation regarding the accuracy or completeness of the BIM you receive. In the event that a conflict arises between the signed and sealed hard-copy construction documents prepared by Lionakis and the BIM, the signed and sealed hard-copy construction documents shall govern.

You, or any party to which this BIM is distributed, are responsible for determining if conflicts exist. By your use of this BIM, you are not relieved of your duty to fully comply with the construction documents, including, but not limited to, the need to check, confirm and coordinate all dimensions and details, take field measurements, verify field conditions and coordinate your work with the work of others for the Project.

Because information presented in the BIM can be modified, unintentionally or otherwise, Lionakis reserves the right to remove all indications of ownership and/or involvement from the BIM.

Under no circumstances shall delivery of the BIM for use by you be deemed a sale by Lionakis, and Lionakis makes no warranties, either express or implied, of merchantability and fitness for any particular purpose. In no event shall Lionakis be liable for any loss of profit or any consequential damages as a result of your use or reuse of the BIM. The BIM shall be provided in Revit 20\_\_.

Lionakis will provide you with the following BIM files:

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The BIM files will be sent to you after signed acknowledgement of this letter is received by Lionakis.

Accepted By:

Recipient: \_\_\_\_\_

Company: \_\_\_\_\_

Address: \_\_\_\_\_

City, State, ZIP: \_\_\_\_\_

Recipient's Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Printed Name: \_\_\_\_\_

Title: \_\_\_\_\_

SECTION 01 35 16  
ALTERATION PROJECT PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Products and installation procedures for patching and extending Work.
- B. Transitions and adjustments.
- C. Repair of damaged surfaces and finishes.
- D. Cleaning.

1.2 RELATED SECTIONS

- A. Section 01 73 29 – Cutting and Patching.
- B. Section 02 41 00 – Demolition.

1.3 ALTERATIONS, CUTTING, AND PROTECTION

- A. Perform Work of this Section under provisions of CBC Chapter 33, CFC Chapters 33 and 35, and NFPA 241.
- B. Assign the work of relocating, removal, cutting, and patching of products, materials, equipment and systems to trades qualified to perform the work, in a manner to cause the least damage to existing surfaces and provide a means of returning surfaces to the level of quality of new Work.
- C. Perform cutting and removal work to remove the minimum amount of materials necessary to accommodate new Work and in a manner to avoid damage to adjacent work.
  - 1. Cut finish surfaces such as concrete, masonry, drywall, plaster, or metals in a straight line at a natural point of division or where required to perform the specified work.
- D. Protect existing finishes, equipment, and adjacent work that are scheduled to remain from damage.
  - 1. Close openings in exterior surfaces to protect existing and new Work from extremes of temperature.
    - a. Maintain existing interior work above 60 degrees F and below 85 degrees F.
    - b. Provide heat and humidity control as needed to prevent damage to existing work and to new Work.
- E. Provide temporary enclosures to separate work areas within the building and from areas occupied by Owner.
- F. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction. When exit routes need to be altered due to construction operations, provide proposed alternate exit route for Owner and DSA review and approval. Proposal shall include, but not be limited to, alternate

exit route, temporary directional signage, and personnel to redirect building occupants during entire duration of exit route blockage.

- G. Coordinate and obtain Owner's approval of construction activity path of travel from outside of building to the areas of work inside the facility.
- H. Hazardous Materials:
  - 1. Existing conditions and Work to be accomplished under this Contract do not deal with the possible or actual existence of hazardous materials (Hazmat), such as asbestos-containing materials, lead-based paint, PCBs, etc.
  - 2. If there is a possibility of disturbing or contacting surfaces or materials containing hazardous materials (Hazmat) during execution of Work under this Contract, Contractor shall suspend Work in that area, immediately inform Owner and Architect, and follow directions and Hazmat-related procedures provided by Owner.
- I. Provide not less than 5 days' notice to Owner of activities that will affect Owner's operations.
  - 1. Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated.

## PART 2 PRODUCTS

### 2.1 PRODUCTS FOR PATCHING AND EXTENDING WORK

- A. New Materials: As specified in product Sections; match existing products, materials, equipment, and systems for patching and extending work.
  - 1. Provide same products, materials, or types of construction as that in existing structure as required to patch, extend, or match existing work.
  - 2. A product, finish, or type of construction that requires patching, extending, or matching shall be installed as necessary to complete the Work and match the consistency of adjacent standards of quality.
- B. Type and Quality of Existing Products: Determine by inspection and testing of products where necessary, referring to existing Work as a standard.

## PART 3 EXECUTION

### 3.1 EXAMINATION

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

### 3.2 PREPARATION

- A. Cut, move, or remove items as necessary for access to alteration and renovation Work at no additional cost to Owner. Replace and restore assemblies at completion to like new condition.
- B. Remove unsuitable material not marked for salvage, such as rotted wood, corroded metals, and deteriorated masonry and concrete. Replace materials as required to receive finished Work.

- C. Remove all debris and abandoned items from area and from concealed spaces.
- D. Remove surface finishes and prepare surfaces for proper installation of new Work and finishes.

### 3.3 INSTALLATION

- A. Coordinate alteration and renovation work to expedite completion and to accommodate Owner occupancy. Patch and extend existing work using skilled mechanics that are capable of matching existing quality of workmanship. Quality of patched or extended work shall be not less than that specified for new Work.
- B. Room Finishes: Complete in all respects including operational mechanical and electrical work.
- C. Remove, cut, and patch items as necessary for access to alterations and renovation Work in a manner to minimize damage and to provide a means of restoring products and finishes to specified condition.
- D. Refinish visible existing surfaces to remain in renovated rooms and spaces to specified condition for each material with a neat and flush transition to adjacent finishes.
- E. In addition to specified replacement of equipment and fixtures, restore existing plumbing, heating, ventilation, air conditioning, and electrical systems to full operational condition.
- F. Install products using procedures specified in individual product Sections to match existing products and finishes.
- G. Patch or replace portions of existing surfaces which are damaged, lifted, discolored, or showing other imperfections.

### 3.4 TRANSITIONS

- A. Where new Work abuts or aligns with existing, provide a smooth and even transition.
- B. Patch Work to match existing adjacent Work in texture and appearance, without breaks, steps, or bulkheads.
- C. When finished surfaces are cut and a smooth transition with new Work is not possible, terminate existing surface along a straight line at a natural line of division. Make transition recommendation to Architect prior to proceeding with the Work.

### 3.5 ADJUSTMENTS

- A. Where change of plane of 1/4 inch or more occurs, submit recommendation for providing a smooth transition to Architect.
  - 1. Where extreme change of plane of 2 inches or more occurs, request from Architect direction for making transition.
- B. Trim existing doors as necessary to clear new floor finish. Refinish trimmed area as required to match door finish.
- C. All openings for surface penetrations shall be cut uniformly around and sealed and closed tight to penetrating elements.

3.6 REPAIR OF DAMAGED SURFACES

- A. Patch or replace portions of existing surfaces that are damaged, lifted, discolored, or showing other imperfections at no additional cost to Owner.
- B. Repair substrate prior to patching finish.

3.7 FINISHES

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

3.8 CLEANING

- A. Clean adjacent Owner-occupied areas of work soiled by work of this Contract.

END OF SECTION

SECTION 01 60 00  
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Products.
- B. Product Delivery Requirements.
- C. Product Storage and Handling Requirements.
- D. Product Options.
- E. Product Substitution Procedures.

1.2 PRODUCTS

- A. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the Work. Does not include machinery and equipment used for preparation, fabrication, conveying, and erection of the Work. Products may also include existing materials or components required for reuse.
- B. All products shall be new, of first class quality, and shall be delivered, installed, connected and finished in every detail, and shall be so selected and arranged as to fit correctly into the proper spaces. Where no specific kind or quality of material is given, a first-class standard article as approved by Architect shall be furnished. Contractor shall provide satisfactory evidence as to the kinds and quality of material and workmanship.
- C. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.
- D. Furnish interchangeable components from same manufacturer for components being replaced.

1.3 PRODUCT DELIVERY REQUIREMENTS

- A. Transport and handle products in accordance with Manufacturer's written installation instructions.
- B. Delivery of materials to the project site shall be coordinated by and received by Contractor or their representative, and stored in secured areas as agreed upon at the job start meeting.
- C. Promptly inspect shipments to assure that products comply with requirements, quantities are correct and products are undamaged.
- D. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement or damage.
- E. Contractor shall take into consideration the available space and location of work site when delivery of materials is necessary.

#### 1.4 PRODUCT STORAGE AND HANDLING REQUIREMENTS

- A. Store and protect products in accordance with Manufacturer's written installation instructions, with seals and labels intact and legible. Store sensitive products in weathertight, climate controlled, enclosures in an environment favorable to product.
- B. For exterior storage of fabricated products, place on sloped supports above ground.
- C. Provide off-site storage and protection when site does not permit on-site storage or protection.
- D. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation and degradation of products.
- E. Store loose granular materials on solid flat surfaces in well-drained area. Prevent mixing with foreign matter.
- F. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
- G. Arrange storage of products to permit access for inspection. Periodically inspect to assure products are undamaged and are maintained under specified conditions.
- H. Contractor shall be responsible to provide all new materials in unopened manufacturer's original containers and deliver such items to project site in good condition for use on this project. Contractor shall be responsible to store all new materials received as per manufacturer recommendations. Any and all materials discovered to be improperly stored and/or damaged will be replaced at the sole expense to Contractor. Any requests for delays or extension of the Contract Time due to the above will not be considered.
- I. Contractor shall use all means necessary to protect all materials before, during, and after installation and to protect the installed work and materials of all other trades and of existing structures. In event of damage, Contractor is to immediately make all repairs and replacements necessary using compatible and like materials.

#### 1.5 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards or description.
- B. Products Specified by Naming One Manufacturer and Stating No Substitutions Allowed, Owner's Standard: Products of manufacturer named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers Without Naming a Product, With a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.
- D. Products Specified by Naming One or More Manufacturers and Naming Product(s) by the First Listed Manufacturer, With a Provision for Substitutions: Submit a request for substitution for any product, by any manufacturer, listed or not listed, other than the product(s) listed.

- E. Basis of Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words Basis of Design, including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other manufacturers, whether listed or not. Submit a substitution request for any product, by any manufacturer, listed or not listed, other than the product(s) listed as Basis of Design.

## 1.6 PRODUCT SUBSTITUTION PROCEDURES

- A. Architect will consider requests for Substitutions only within 35 days after Award of the Contract.
- B. Reference to any product, material, equipment, article, system, service or patented process, by trade, catalogue number, name brand product, or product manufacturer is for information only and shall not be construed as limiting competition.
- C. Substitutions will only be considered when one or more of the following conditions are met:
  - 1. All aspects of the proposed substitution meet or exceed the criteria for the specified product.
  - 2. The proposed changes are in keeping with the general intent of the Contract Documents.
  - 3. The request is fully documented and timely and properly submitted.
  - 4. The specified product cannot be provided within the Contract Time.
  - 5. The request is directly related to an or equal clause or similar language in the Contract Documents.
  - 6. The request offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities that Owner must assume. Owner's additional responsibilities may include, but not be limited to, compensation to Architect for redesign and/or evaluation services and increased cost of other construction by Owner.
  - 7. The specified product becomes unavailable through no fault of Contractor.
  - 8. The specified product cannot receive necessary approvals by governing authorities, and the requested substitution can be approved by governing authorities in a timely manner.
  - 9. It can be demonstrated that the specified product cannot be provided in a manner that is compatible with other materials and Contractor certifies that the proposed substitution will overcome the incompatibility.
  - 10. It can be demonstrated that the specified product cannot be coordinated with other materials and Contractor certifies that the proposed substitution can be coordinated.
  - 11. The specified product cannot provide the warranty required by the Contract Documents and Contractor certifies that the proposed substitution provides the required warranty.
- D. Substitutions will not be considered when one or more of the following conditions occur:
  - 1. Acceptance would require revisions to the Contract Documents, Contract Time extensions, or an increase in the Contract Sum.
  - 2. They are indicated or implied on shop drawing or product data submittals, without separate written request.
  - 3. When the specified product cannot be provided as a result of failure of Contractor to pursue the Work in a timely manner or properly coordinate construction activities.

- E. In those cases where the Specifications designate a product, material, equipment, article, system, service or patented process by specific brand or trade name and there is only one brand or trade name listed, the item involved is:
  - 1. Required to be used since it is a unique or novel product application, or
  - 2. Required to match other products in use by Owner, or
  - 3. Is the only brand or trade name known to Architect.
- F. Document each request on Substitution Request Form attached at the end of this Section with complete data substantiating compliance of proposed Substitution with the Contract Documents. The burden of proof as to comparative quality, suitability and performance of proposed product(s), material(s), equipment, article(s), system(s), service(s) or patented process(es) shall be upon Contractor. Architect will be the sole judge of the equality of the proposed substitution versus the specified item(s).
- G. A substitution request constitutes a representation that Contractor:
  - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
  - 2. Will provide the same or better warranty for the Substitution as for the specified product.
  - 3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
  - 4. Waives claims for additional costs or time extensions which may subsequently become apparent.
  - 5. Will reimburse Owner for review services associated with approvals by authorities having jurisdiction.
- H. Substitution Submittal Procedure:
  - 1. Submit request for Substitution electronically. Limit each request to one proposed Substitution.
  - 2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence.
  - 3. Architect will notify Contractor, in writing, of decision to accept or reject request.
  - 4. Incomplete Substitution Request package will not be reviewed and will be returned to Contractor. Contractor shall then provide the specified item.
  - 5. Only one request for substitution will be allowed. If proposed substitution is not accepted by Architect, Contractor shall provide the specified item.
  - 6. Use of accepted substitutions shall in no way relieve Contractor from responsibility for compliance with Drawings and Specifications.
  - 7. All costs associated with accepted substitutions shall be borne by Contractor including, but not limited to, required changes to the Project's design, architectural and/or engineering design fees, detailing, Agency approvals and fees, and all additional construction costs caused by substitution.
  - 8. All substitutions affecting structural or fire/life safety items will require approval from DSA prior to fabrication and installation on the project.

## PART 2 PRODUCTS

### 2.1 MATERIALS

- A. Materials furnished shall be new and never been used before, unless specified otherwise, and will satisfy the requirements herein and all specifications referenced by provisions within these specifications. Contractor shall furnish, upon request of Architect, an affidavit from the manufacturer or supplier to the effect that materials furnished shall conform to the General Conditions, the latest revision of AWWA Specifications, ASTM, and Federal Specifications that pertain. All materials shall be installed in accordance with manufacturer's recommendations and the Standard Drawings and Specifications that pertain. Material for one specific product shall be one manufacturer unless otherwise approved by Architect. All materials shall be subject to inspection after delivery to the site and during installation of the work. Failure of the Inspector or Architect to note faulty material shall not relieve Contractor of the responsibility for removing or replacing any such material at no additional cost to Owner.
- B. For the ease of maintenance and parts replacement, to the maximum extent possible use materials of a single manufacturer, delivered in manufacturer's original, unopened containers with labels intact and legible, and in sufficient quantity to allow continuity of work. Deviation from this requirement shall require written approval from Owner and Architect.
- C. Architect reserves the right to reject any materials list which contains materials from various manufacturers if suitable materials can be secured from fewer manufacturers and to require that source of materials be unified to maximum extent possible.

## PART 3 EXECUTION

Not Used

END OF SECTION



### **SUBSTITUTION REQUEST FORM**

SUBSTITUTION REQUEST NUMBER: \_\_\_\_\_

TO: \_\_\_\_\_

PROJECT: \_\_\_\_\_

SPECIFIED ITEM:

| Section | Page | Paragraph | Description |
|---------|------|-----------|-------------|
|         |      |           |             |

The undersigned requests consideration of the following:

Proposed Substitution (Manufacturer, Model # or Name, Color, Etc.): \_\_\_\_\_

History: ☐ New Product, ☐ Available 2-5 Years, ☐ Available 6-10 Years, ☐ Available 10+ Years

Provide UL, ITS, WHI, (or other) listing / rating of proposed substitution: \_\_\_\_\_

Attached data shall include, but not be limited to, product, specification, drawings, performance and test data adequate for evaluation of the request for the proposed substitution product and the specified product, with applicable portions of the proposed substitution and the specified product data clearly identified in a point-by-point direct comparison chart. Incomplete form and attachments will result in rejection of substitution request.

Requestor shall address the following items on this Substitution Request Form. Use a separate attached sheet attached as needed:

1. Reason for not providing specified item:

\_\_\_\_\_  
\_\_\_\_\_

2. Will proposed substitution affect dimensions indicated on Drawings? ☐ (Yes) ☐ (No)

If yes, how? \_\_\_\_\_

3. Will proposed substitution affect Electrical, Mechanical, Structural, Architectural, etc.?

☐ (Yes) ☐ (No) If yes, explain:

\_\_\_\_\_  
\_\_\_\_\_

4. Is proposed substitution larger or smaller than specified product? ☐ (Yes) ☐ (No)

If yes, state size of substitute product:

\_\_\_\_\_

5. Does proposed substitution weight less/more than specified product? ☐ (Yes) ☐ (No)  
If yes, state weight of substitute product:  
\_\_\_\_\_
6. Will proposed substitution affect other trades and/or parts of the work? ☐ (Yes) ☐ (No)  
If yes, explain all effects:  
\_\_\_\_\_  
\_\_\_\_\_
7. Comparison between proposed substitution and specified product (Similarities / Differences)?  
\_\_\_\_\_  
\_\_\_\_\_
8. If Substitution Request is accepted, Owner will receive a credit of \$ \_\_\_\_\_. The Contract Sum will be adjusted accordingly.
9. Will proposed substitution affect the Contract Time? ☐ (Yes) ☐ (No)  
If yes,  (Add)  (Deduct) \_\_\_\_\_ calendar days.
- \_\_\_\_\_

INITIAL

UNDERSIGNED CERTIFIES:

- \_\_\_\_\_ Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- \_\_\_\_\_ Proposed substitution has same or better warranty as specified product.
- \_\_\_\_\_ Proposed substitution has same or better maintenance service and availability of replacement parts as specified product.
- \_\_\_\_\_ Proposed substitution will not affect or delay the Construction Schedule.
- \_\_\_\_\_ Claims for additional costs related to accepted substitution, which may subsequently become apparent, are hereby waived.
- \_\_\_\_\_ Proposed substitution will not affect dimensions and functional clearances.
- \_\_\_\_\_ Coordination, installation, and changes in the Work as necessary for installation of accepted substitution will be complete in all respects, at no additional cost to Owner.
- \_\_\_\_\_ Contractor will pay for all costs associated with changes to the project's design, including, but not limited to, architectural or engineering design fees, detailing, Agency approvals and construction costs caused by the requested substitution.
- \_\_\_\_\_ The function, appearance and quality of the proposed substitution is equivalent or superior to the specified item.

The undersigned certifies that the above is accurate and correct.

Signature: \_\_\_\_\_

Company: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

Date: \_\_\_\_\_

Telephone: \_\_\_\_\_

Attachments: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ Other (Describe)

\_\_\_\_\_

**Architect's Review and Action:**

\_\_\_\_\_ Substitution Accepted – Make submittals in accordance with Specification Division 01.

\_\_\_\_\_ Substitution Accepted as Noted - Make submittals in accordance with  
Specification Division 01.

\_\_\_\_\_ Substitution Rejected – Provide specified product.

\_\_\_\_\_ Substitution Request Received Too Late – Provide specified product.

By: \_\_\_\_\_ Date: \_\_\_\_\_

Remarks: \_\_\_\_\_

\_\_\_\_\_



SECTION 01 70 00  
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Closeout procedures.
- B. Final cleaning.
- C. Starting of systems.
- D. Demonstration and instructions.
- E. Testing, adjusting and balancing.
- F. Protecting installed construction.
- G. Project record documents.
- H. Operation and maintenance data.
- I. Manual for materials and finishes.
- J. Manual for equipment and systems.
- K. Spare parts and maintenance products.
- L. Extra materials.
- M. Product warranties and product bonds.
- N. Maintenance service.

1.2 RELATED SECTIONS

- A. Section 01 33 00 – Submittal Procedures.

1.3 CLOSEOUT PROCEDURES

- A. Submit written certification that the Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with the Contract Documents and ready for Architect's review.
- B. Provide submittals to Architect and Owner required by DSA.
- C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.
- D. The submission, by Contractor, of satisfactory evidence that no claim or lien exists against Contractor for labor done or materials furnished under the Contract.
- E. The submission, by Contractor to Architect, of 2 copies of the completed and executed DSA Final Verified Reports.

- F. Submit items to Architect or other parties as required by individual sections of the Specifications.

#### 1.4 FINAL CLEANING

- A. Execute final cleaning prior to final project assessment.
- B. Clean interior and exterior glass and surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
- C. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to surface and material being cleaned.
- D. Replace filters of operating equipment affected by start-up procedures.
- E. Clean debris from roofs, gutters, downspouts, and drainage systems.
- F. Clean site; sweep paved areas, rake clean landscaped surfaces.
- G. Remove waste and surplus materials, rubbish, and construction facilities from the site.
- H. Contractor shall be responsible for restoring the work area and all auxiliary areas utilized during the work to conditions that are equal to or better than existed prior to project commencement. Any damages to interior or exterior building surfaces, walkways, landscaping, utilities, etc., shall be repaired or replaced at the sole expense to Contractor.
- I. After completion and final acceptance of the project, Contractor shall immediately remove all equipment, fencing, construction materials, and debris from project site.

#### 1.5 STARTING OF SYSTEMS

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Notify Architect and Owner 7 days prior to start-up of each item.
- C. Verify each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.
- D. Verify tests, meter readings, and specified electrical characteristics agree with those required by equipment or system manufacturer.
- E. Verify wiring and support components for equipment are complete and tested.
- F. Execute start-up under supervision of applicable manufacturer's representative or Contractors' personnel in accordance with Manufacturer's written installation instructions.
- G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.
- H. Submit a written report in accordance with Section 01 33 00 that equipment or system has been properly installed and is functioning correctly.

## 1.6 DEMONSTRATION AND INSTRUCTIONS

- A. Demonstrate operation and maintenance of products to Owner's personnel 2 weeks prior to date of final inspection.
- B. Demonstrate Project equipment instructed by qualified manufacturer's representative who is knowledgeable about the Project.
- C. For equipment or systems requiring seasonal operation, perform demonstration for other season within 6 months.
- D. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.
- E. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at agreed time, at designated location.
- F. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

## 1.7 TESTING, ADJUSTING, AND BALANCING

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.
- B. Owner will appoint, employ, and pay for services of independent firm to perform testing, adjusting, and balancing.
- C. Reports will be submitted by independent firm to Contractor, Architect, and Owner indicating observations and results of tests and indicating compliance or non-compliance with requirements of Contract Documents.

## 1.8 PROTECTING INSTALLED CONSTRUCTION

- A. Protect installed Work and provide special protection where specified in individual specification Sections.
- B. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
- C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
- E. Prohibit traffic or storage upon waterproofed or roofed surfaces. When traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- F. Prohibit traffic from landscaped areas.

## 1.9 PROJECT RECORD DOCUMENTS

- A. Maintain on site, 1 set of the following record documents; record actual revisions to the Work:

1. Contract Drawings, all divisions and trades.
  2. Specifications.
  3. Addenda.
  4. Change Orders, Construction Change Documents, and other modifications to the Contract.
  5. Reviewed and accepted shop drawings, product data, and samples.
  6. Manufacturer's written instructions for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress, not less than weekly.
- E. Specifications: Legibly mark and record at each product Section description of actual products installed, including the following:
1. Manufacturer's name and product model and number.
  2. Product substitutions or alternates utilized.
  3. Changes made by Addenda and other modifications to the Contract.
- F. Record Documents and Shop Drawings: Legibly mark each item to record actual construction including:
1. Measured depths of foundations in relation to finish first floor datum.
  2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
  3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
  4. Field changes of dimension and detail.
  5. Details not on the original Contract Drawings.
  6. All changes and clarifications as a result of Change Orders, Requests for Information, Construction Change Directives, and Architect's Supplemental Instructions.
- G. Contractor shall keep the progress Project Record Documents current. In the event that these documents are not kept current, a portion of the monies due Contractor will be withheld from each Application for Payment until the Project Record Documents are brought up to current status, to the satisfaction of Architect.
- H. Submit Project Record Documents to Architect with claim for final Application for Payment.

#### 1.10 OPERATION AND MAINTENANCE DATA

- A. Submit complete operation and maintenance information in digital format for all manufactured materials and equipment installed on the Project prior to final inspection.
- B. Prepare digital manual with title OPERATION AND MAINTENANCE INSTRUCTIONS, and title of Project.
- C. Internally bookmark the digital manual, logically organized, and titled as described below.

- D. Contents: Prepare a Table of Contents for digital manual, with each product or system description identified, in 3 parts as follows:
1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect, Contractor, Subcontractors, and major equipment suppliers.
  2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification Section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
    - a. Significant design criteria.
    - b. List of equipment.
    - c. Parts list for each component.
    - d. Written operating instructions.
    - e. Written maintenance instructions for equipment and systems.
    - f. Written maintenance instructions for finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
  3. Part 3: Project documents and certificates, including the following:
    - a. Shop drawings and product data.
    - b. Air and water balance reports.
    - c. Certificates.
    - d. Photocopies of warranties and bonds.
- E. Submit Digital Operation and Maintenance Data in final form 15 days prior to final inspection for Architect review and comment. Revise content of documents as required prior to final submittal.
- F. Submit final Digital Operation and Maintenance Data within 10 days after final inspection.

#### 1.11 MANUAL FOR MATERIALS AND FINISHES

- A. Submit digital copy of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review and provide comments on digital preliminary draft.
- B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within 10 days after acceptance.
- C. Submit digital copy of completed manual 15 days prior to final inspection. Draft digital copy will be reviewed and returned with Architect comments. Revise content of document sets as required prior to final submission.
- D. Submit revised final manual within 10 days after final inspection.
- E. Building Products, Applied Materials, and Finishes: Include product data, with catalog number, size, composition and color, and texture designations. Include information for re-ordering custom manufactured products.
- F. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

G. Moisture Protection and Weather Exposed Products: Include product data listing applicable reference standards, chemical composition, and details of installation. Include recommendations for inspections, maintenance, and repair.

H. Additional Requirements: As specified in individual product specification Sections.

#### 1.12 MANUAL FOR EQUIPMENT AND SYSTEMS

A. Submit digital copy of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review and provide comments on digital preliminary draft.

B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within 10 days after acceptance.

C. Submit digital copy of completed manual 15 days prior to final inspection. Draft digital copy will be reviewed and returned with Architect comments. Revise content of document sets as required prior to final submission.

D. Submit revised final manual within 10 days after final inspection.

E. Each Item of Equipment and Each System: Include description of unit or system, and component parts. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and model number of replaceable parts.

F. Operating Procedures: Include start-up, break-in, and routine normal operating instructions, and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and special operating instructions.

G. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

H. Include servicing and lubrication schedule, and list of lubricants required.

I. Include Manufacturer's written operation and maintenance instructions.

J. Include sequence of operation by controls manufacturer.

K. Include original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

L. Include list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

M. Include test and balancing reports.

N. Additional Requirements: As specified in individual product specification Sections.

#### 1.13 SPARE PARTS AND MAINTENANCE MATERIALS

A. Furnish spare parts, maintenance, and extra products in quantities specified in individual specification Sections.

B. Deliver to Project site and place in location as directed by Owner; obtain receipt prior to final payment.

#### 1.14 EXTRA MATERIALS

- A. Where extra materials are required by individual Sections, the quantities of materials specified shall be delivered to the location designated by the Owner. Extra materials are property of the Owner and shall not be used by the Contractor for any reason.

#### 1.15 PRODUCT WARRANTIES AND PRODUCT BONDS

- A. Obtain warranties and bonds executed in duplicate by responsible subcontractors, suppliers, and manufacturers, within 10 days after completion of applicable item of work.
- B. Execute and assemble transferable warranty documents and bonds from subcontractors, suppliers, and manufacturers.
- C. Verify documents are in proper form and contain full information.
- D. Co-execute submittals when required.
- E. Include Table of Contents and assemble in digital format.
- F. Submit prior to final Application for Payment.
- G. Time Of Submittals:
  - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
  - 2. Make other submittals within 10 days after Date of Project Completion, prior to final Application for Payment.
  - 3. For items of Work for which acceptance is delayed beyond Date of Project Completion, submit within 10 days after acceptance, listing date of acceptance as beginning of warranty or bond period.

#### 1.16 MAINTENANCE SERVICE

- A. Unless indicated otherwise, furnish service and maintenance of components indicated in specification Sections for 1 year from date of Project Completion.
- B. Examine system components at frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
- C. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by manufacturer of original component.
- D. Do not assign or transfer maintenance service to agent or Subcontractor without prior written consent of Owner.

### PART 2 PRODUCTS

Not Used

### PART 3 EXECUTION

Not Used

END OF SECTION



SECTION 01 73 29  
CUTTING AND PATCHING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Procedural requirements and limitations for cutting and patching work.
- B. Patching of existing materials and construction disturbed by Work under this Contract, including repair of damage to existing materials and construction caused by:
  - 1. Installation of new products, materials, and equipment or systems.
  - 2. Relocation or reinstallation of existing products, materials, and equipment or systems.

1.2 RELATED SECTIONS

- A. Section 01 33 00 – Submittal Procedures.
- B. Section 01 35 16 – Alteration Project Procedures: Cutting and patching for alterations work.
- C. Section 01 60 00 – Product Requirements: Product options and substitutions.
- D. Divisions 02 through 28 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work, including the following:
  - 1. Cutting and patching incidental to work of the individual Section.
  - 2. Advance notification to other Sections of openings required in work of those Sections.
  - 3. Limitations on cutting structural members.

1.3 SUBMITTALS

- A. Submit written request in advance of cutting or patching which affects:
  - 1. Integrity of moisture resistant and water resistant elements.
  - 2. Utility services and mechanical/electrical systems.
  - 3. Operational elements.
  - 4. Visual qualities of sight exposed elements.
  - 5. Existing structural elements.
  - 6. Efficiency, maintenance, or safety of element.
  - 7. Work of Owner or separate contractor.
- B. Include in request:
  - 1. Identification of Project.
  - 2. Location and description of affected Work.
  - 3. Necessity for cutting or patching.
  - 4. Description of proposed Work and products to be used.
  - 5. Alternatives to cutting and patching.

6. List of services and systems that will be temporarily out of service and length of disruption.
7. List of services and systems that will be relocated.
8. Reinforcement to structural elements, with details and engineering calculations showing integration of reinforcement with original structure.
9. Effect on work of Owner or separate contractor.
10. Written permission of affected separate contractor.
11. Date and time the work will be executed.

C. Architect's, Owner's, and DSA's Approval: Obtain approval of cutting and patching submittals before commencing cutting and patching work. Approval does not waive the right to require removal and replacement of unsatisfactory work.

#### 1.4 DEFINITIONS

- A. Cutting: Removal of in-place construction for installation or performance of other Work.
- B. Patching: Repair work required for restoration of damaged surfaces to original condition after installation of other Work.

#### 1.5 QUALITY ASSURANCE

- A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
- B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or results in increased maintenance or decreased operational life or safety.
- C. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching work, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

#### 1.6 WARRANTY

- A. Existing Applicable Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by appropriate methods and with suitable materials so that existing applicable warranties are not voided.

### PART 2 PRODUCTS

#### 2.1 MATERIALS

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

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Examine existing conditions prior to commencing Work, including elements subject to damage or movement during cutting and patching.
- B. After uncovering existing work, assess conditions affecting performance of Work.
- C. Beginning of cutting or patching means acceptance of existing conditions.
- D. Identify hazardous substances or conditions exposed during the Work to Architect for decision or remedy.

### 3.2 PREPARATION

- A. Provide temporary supports to ensure structural integrity of the Work. Provide devices and methods to protect other portions of Project from damage.
- B. Provide protection from elements for areas which may be exposed by uncovering Work.

### 3.3 CUTTING

- A. Execute cutting and fitting to complete the Work.
- B. Uncover in-place Work to reinstall improperly sequenced Work.
- C. Remove and replace defective or non-conforming Work.
- D. Obtain material samples of installed Work for testing, when requested.
- E. Provide openings in the Work for penetration of mechanical and electrical work.
- F. Employ experienced installer to perform cutting of moisture resistant and water resistant elements, and surfaces exposed to view.
- G. Cut rigid materials in straight, true, and parallel, or perpendicular lines.
- H. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
- I. Cut masonry and concrete materials using masonry saw or core drill.
- J. Pneumatic tools are not allowed without prior approval from Architect and Owner.
- K. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.

### 3.4 PATCHING

- A. Execute patching to complement adjacent Work.
- B. Fit products together to integrate with other Work.

- C. Execute Work by appropriate methods to avoid damage to other Work and to provide surfaces suitable for patching and finishing.
- D. Employ experienced installer to perform patching of moisture resistant and water resistant elements, and surfaces exposed to view.
- E. Restore Work with new materials and products in accordance with requirements of the Contract Documents.
- F. Fit Work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- G. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.
- H. Refinish surfaces to match adjacent finish in all respects (type, texture, thickness, color, etc.). For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

### 3.5 CLEANING

- A. Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION

## SECTION 02 41 00

### DEMOLITION

#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Removal of designated construction.
- B. Identification of utilities.
- C. Demolition requirements.

##### 1.2 RELATED SECTIONS

- A. Division 01 Sections, as applicable.

##### 1.3 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Division 01.
- B. Accurately record actual locations of capped utilities and subsurface obstructions.

##### 1.4 REGULATORY REQUIREMENTS

- A. Perform work of this Section under provisions of CBC Chapter 33, CFC Chapter 33, and NFPA 241 for demolition work, safety of structure, dust control and safety of occupants.
- B. Obtain required permits from authorities.
- C. Do not close or obstruct egress width to exits.
- D. Do not disable or disrupt building fire or life safety systems without 3-day prior written notice to Owner.
- E. Conform to procedures applicable when discovering hazardous or contaminated materials.

##### 1.5 SCHEDULING

- A. Schedule work under the provisions of Division 01.
- B. Describe demolition removal procedures and schedule.

#### PART 2 PRODUCTS

Not Used

#### PART 3 EXECUTION

##### 3.1 PREPARATION

- A. Provide, erect, and maintain temporary barriers as required.

- B. Erect and maintain temporary partitions to prevent spread of dust, odors, and noise to adjoining facilities.
- C. Protect existing materials and finishes that are not scheduled or otherwise required to be demolished.
- D. Mark location of utilities.

### 3.2 DEMOLITION REQUIREMENTS

- A. Conduct demolition to minimize interference with adjacent and occupied buildings.
- B. Maintain protected egress and access to the Work.

### 3.3 DEMOLITION

- A. Refer to Drawings for specific items to be demolished.
- B. Disconnect, remove, cap, and identify designated utilities within demolition areas.
- C. Demolish in an orderly and careful manner. Protect existing supporting structural members and materials.
- D. Except where noted otherwise, remove demolished materials from site. Do not bury or burn materials on site.
  - 1. Carpet: Remove carpet and recycle (divert from landfill), regardless of manufacturer, fiber type, or construction. Reclamation Agency and Carpet Remover shall certify in writing that used carpet was removed and recycled. Provide a certificate of proof of recycling.
- E. Remove demolished materials from site as Work progresses. Upon completion of Work, leave areas in clean condition.
- F. Remove temporary Work.

END OF SECTION

SECTION 05 12 00  
STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Structural steel framing and support members.
- B. Base plates.
- C. Grouting under base plates.

1.2 REFERENCES

- A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.
- B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.
- C. Referenced Standards:
  - 1. AISC 303-16 – Code of Standard Practice for Structural Steel Buildings and Bridges.
  - 2. AISC 360 – Specification for Structural Steel Buildings.
  - 3. ANSI B18.22.1 – Plain Washers.
  - 4. ANSI B18.23.1 – Beveled Washers.
  - 5. ASTM A36/A36M – Standard Specification for Carbon Structural Steel.
  - 6. ASTM A53/A53M – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
  - 7. ASTM A108 – Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
  - 8. ASTM A123/A123M – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  - 9. ASTM A307 – Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 psi Tensile Strength.
  - 10. ASTM A500 – Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
  - 11. ASTM A572/A572M – Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
  - 12. ASTM A780/A780M – Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
  - 13. ASTM A992/A992M – Standard Specification for Steel for Structural Shapes for Use in Building Framing.

- 14. ASTM F844 – Standard Specification for Washers, Steel, Plain (Flat), Unhardened for General Use.
- 15. ASTM F1554 – Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
- 16. AWS A2.4 – Standard Symbols for Welding, Brazing, and Nondestructive Examination.
- 17. AWS D1.1 – Structural Welding Code – Steel.
- 18. AWS D1.4 – Structural Welding Code – Reinforcing Steel.
- 19. AWS D1.8 – Structural Welding Code – Seismic Supplement.
- 20. AWS D2.0 – Specifications for Welded Highway and Railway Bridges.
- 21. RCSC – Specification for Structural Joints Using High-Strength Bolts.
- 22. SSPC – Good Painting Practice: Painting Manual, Volumes 1 and 2.

### 1.3 SUBMITTALS

- A. Submit under provisions of Division 01.
- B. Shop Drawings:
  - 1. Pages of electronic submittals shall be labeled and bookmarked. Bookmark naming shall match the naming of corresponding shop drawing sheets.
  - 2. Indicate profiles, sizes, spacing, and locations of structural members, attachments, fasteners, and required connections, including connections not detailed on Drawings.
  - 3. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.
  - 4. Clearly distinguish between shop and field bolts and welds.
  - 5. Show the method of repairing drain and vent holes with either plugs or plates after galvanizing.
- C. Manufacturer's Mill Certificate: Submit Manufacturer's Certificates under provisions of Division 01, certifying that steel, fasteners, and welding electrodes meet or exceed specified requirements.
- D. Mill Test Reports: Submit Manufacturer's Reports under provisions of Division 01, indicating structural strength, destructive and non-destructive test analysis, and ladle analysis.
- E. Submit product data for type of metal primer proposed for use.
- F. Welders' Certificates: Submit certificates under provisions of Division 01, certifying welders employed on the Work, verifying AWS qualifications within the previous 12 months.
  - 1. Welders who have not performed welding for period of 3 or more months shall be requalified.
  - 2. Welders whose work fails to pass inspection shall be requalified before performing further welding.
  - 3. Contractor shall pay costs of certifying qualifications.
- G. Welding Procedures: Submit proposed Welding Procedure Specifications (WPS). Where WPS is not prequalified by AWS D1.1, submit supporting Performance Qualification Records (PQR).

H. Qualification Data: For qualified Fabricator and Installer.

#### 1.4 DEFINITIONS

A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, Code of Standard Practice for Steel Buildings and Bridges.

#### 1.5 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with the AISC Specification for Structural Steel Buildings, Code of Standard Practice for Steel Buildings and Bridges and Quality Criteria and Inspection Standards.

B. Fabricator Qualifications: Company specializing in performing the work of this Section with sufficient documented experience.

C. Installer (Erector) Qualifications: Company specializing in performing the work of this Section.

#### 1.6 REGULATORY REQUIREMENTS

A. Conform to 2025 California Building Code (CBC), Chapter 16A "Structural Design", Chapter 22A "Steel", and Chapter 17A "Special Inspections and Tests".

B. Structural Tests and Inspections: Refer to DSA Structural Tests and Inspection Sheet (DSA Form DSA-103).

C. Materials:

1. Material identification per CBC Chapter 22A, Section 2201A.2.
2. Protection of structural steel per AISC 360.

#### 1.7 FIELD MEASUREMENTS

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

B. Coordinate fabrication and delivery of structural steel items with concrete work and with all other trades to permit such items to be built into the structure without delay.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

A. Delivery of Materials to be Installed Under Other Sections: Anchor bolts and other anchorage devices which are embedded in cast-in-place concrete construction shall be delivered to the project site in time to be installed before start of cast-in-place concrete operations.

B. Storage of Materials:

1. Structural steel members to be stored at the Project site shall be placed above ground, on platforms, skids, or other supports.
2. Steel shall be protected from corrosion.
3. Other materials shall be stored in a watertight, dry place until ready for installation in the Work.
4. Packaged materials shall be stored in their original package or container.

5. Do not store materials on the structure in a manner that might cause distortion or damage to members of supporting structures. Repair or replace damaged materials or structure as directed by Architect.

## PART 2 PRODUCTS

### 2.1 MATERIALS

#### A. Structural Steel Members:

1. ASTM A992 Grade 50 for W and WT shapes.
2. ASTM A36/A36M or A572 Grade 50 for plates, as noted on Drawings.
3. ASTM A36/A36M for channels, angles and all other shapes.

#### B. HSS:

1. Tubing: ASTM A500, Grade C.
2. Round: ASTM A500, Grade C.

#### C. Pipe: ASTM A53/A53M, Type E or S, Grade B.

#### D. Bolts and Nuts: ASTM A307, Grade A, with ASTM A563, Grade A, hex nuts; ASTM F3125, Grade A325N, Type 1, with ASTM A563, Grade C, heavy hex nuts; anchor bolts, ASTM F1554, grade as indicated on Drawings.

#### E. Welding Materials:

1. Typical Weld Locations: AWS D1.1; type required for materials being welded.

#### F. Circular Washers for Common Bolts: ASTM F844, Type A, and ANSI B18.22.1.

#### G. Beveled Washers for Common Bolts: ANSI B18.23.1.

#### H. Post-Installed Concrete Anchors: Evaluation Agency approved, as indicated and manufactured by Hilti or accepted equal.

#### I. Eye Bolts and Nuts: ASTM A108, Grade 1030, cold-finished carbon steel.

#### J. Sleeve Nuts: ASTM A108, Grade 1018, cold-finished carbon steel.

#### K. Welded Headed Stud Anchors: ASTM A108. Welding, testing and inspection shall be in accordance with AWS D1.1.

#### L. Steel Shop and Touch-Up Primer: TNEMEC Series 115 Uni-Bond DF or accepted equal.

#### M. Shop and Touch-Up Zinc-Rich Primer for Galvanized Surfaces: ZRC Galviline Galvanizing Repair Compound as manufactured by ZRC Worldwide Company, Marshfield, MA; 800-831-3275, [www.zrcworldwide.com](http://www.zrcworldwide.com), or accepted equal.

#### N. Weld Filler Material: All weld filler material shall have a minimum tensile strength of 70 KSI per AWS D1.1, latest edition approved by code enforcement agency.

#### O. Grout: Non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing additives, capable of developing a minimum compressive strength of 7,000 psi at 28 days.

## 2.2 FABRICATION

- A. General: Fabricate items of structural steel in accordance with AISC specifications and as indicated on Drawings. Fabrication tolerances shall be reduced as required for acceptance of subsequent work. Properly mark and match-mark all materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling.
1. Welded splicing of structural members may be done only upon written acceptance by Architect, unless otherwise indicated on Drawings. Splicing shall be thoroughly examined by a nondestructive means at Contractor's expense. Inspection shall be made by a recognized and approved testing laboratory; procedure, technique and standards of acceptance shall conform to Appendix E of AWS Standard D2.0. Correct faulty welds and re-examine in a manner specified for original welds.
- B. Welded Construction:
1. Weld in accordance with AISC using manual shielded arc method or flux cored arc method in accordance with AWS D1.1 and AWS D1.8. Groove welds shall be complete joint penetration welds, unless specifically designated otherwise on Drawings.
  2. Remove back-up plates for complete joint penetration welds when specifically requested by testing laboratory to perform non-destructive testing. Remove at no cost to Owner.
  3. Weld reinforcing steel in accordance with AWS D1.4 and using prequalified procedures.
- C. Connections:
1. Weld or bolt shop connections as indicated.
  2. Bolt field connections except where welded or other connections are indicated. Provide unfinished threaded fasteners only where noted on Drawings and for temporary bracing to facilitate erections.
- D. Holes for Other Work: Provide holes required for securing other work to structural steel framing, and for the passage of work through steel framing members as indicated. Provide threaded nuts welded to framing, and other specialty items as shown to receive other work. Cut, drill, or punch holes perpendicular to metal surfaces. Thermally cut holes are only permitted at anchor rod holes.

## 2.3 FINISHES

- A. Surfaces coatings of steel shall be as indicated in table below, unless noted otherwise.

| Exposure                                  | Coating requirements         |
|-------------------------------------------|------------------------------|
| Interior – Concealed by interior finishes | Steel not receiving coatings |
| Interior – Exposed unless noted otherwise | Primed steel                 |

- B. Shop Cleaning and Coating of Steel:

1. Hot-Dip Galvanized Steel:
  - a. Galvanize elements as shown in table, including exterior embedments and anchors in direct contact with concrete construction.
  - b. Galvanize in accordance with ASTM A123/A123M with the minimum specified average coating thickness grade by material category and thickness range.

- c. Prior to galvanizing, provide commercial blast cleaning SSPC-SP 6, chemical clean, pickle, and flux steel as part of the galvanizing process. Shop painting after hot-dip galvanizing is not required, unless specifically noted otherwise.
    - d. Drain and vent holes required for galvanizing shall be identified in the shop drawings. Drain holes shall be inconspicuous and not compromise the integrity of weather-resisting envelopes. Shop drawings shall show the method of repairing drain and vent holes with either plugs or plates after galvanizing. Drain and vent hole repairs require Architect's review and acceptance.
  - 2. Primed Steel:
    - a. Surfaces prepared in accordance with SSPC-SP 1 and SSPC-SP 6, unless noted otherwise.
      - 1) Clean steel surfaces at the shop to remove grease, mill scale, rust, dirt, dust, and other foreign matter. Prevent contamination of the cleaned surfaces before coating. Shop coat the prepared surfaces with primer, unless noted otherwise.
    - b. Primer shall be applied in one coat, to meet or exceed the minimum mil thickness required by the primer manufacturer. Provide compatible ferrous metal primers as specified in Section 09 91 00, or accepted equal, as standard with the fabricator.
  - 3. Fire Protected Steel:
    - a. Prepare component surfaces in accordance with SSPC-SP 1 and SSPC-SP 6 or SSPC-SP 10.
    - b. Steel receiving cementitious fireproofing: Provide manual cleaning to obtain surface condition required for proper adhesion of field applied sprayed-on fireproofing, as recommended by the fireproofing manufacturer. Do not paint interior steel scheduled to receive sprayed-on fireproofing.
    - c. Steel receiving intumescent fireproofing: Provide commercial blast cleaning to obtain surface condition required for proper adhesion of primer, as recommended by the fireproofing manufacturer.
  - 4. Steel Not Receiving Coatings:
    - a. Prepare structural component surfaces in accordance with SSPC-SP 1 and SSPC-SP 2.
- C. Column Bases: Column bases and base plates shall be finished in accordance with the following requirements:
- 1. Steel bearing plates 2 inches or less in thickness are permitted without milling provided a smooth and notch-free contact bearing surface is obtained. Steel bearing plates over 2 inches but not over 4 inches in thickness are permitted to be straightened by pressing or, if presses are not available, by milling for bearing surfaces, except as stipulated in subparagraphs (2) and (3) below, to obtain a smooth and notch-free contact bearing surface. Steel bearing plates over 4 inches in thickness shall be milled for bearing surfaces, except as stipulated in subparagraphs (2) and (3) below.
  - 2. Bottom surfaces of bearing plates and column bases that are grouted to ensure full bearing contact on foundations need not be milled.
  - 3. Top surfaces of bearing plates need not be milled when complete-joint-penetration groove welds are provided between the column and the bearing plate.

## 2.4 TESTING AND INSPECTION

A. General: Owner will engage and pay a testing agency to perform the following services:

1. Review manufacturer's certificates and check heat numbers and that the steel is properly identified in accordance with CBC Section 2202A "Identification of Steel for Structural Purposes".
2. Testing of unidentified materials or as directed by Owner.
3. Provide inspection per CBC Sections 1705A.2 and 1705A.13.
4. Provide testing per CBC Section 1705A.14.
5. In the event an examination discloses faulty welds and additional tests are required to fully examine the welds, the cost of the additional tests shall be paid for by Owner and back-charged to Contractor.
6. All defective welds shall be repaired and tested at no expense to Owner.
7. Perform any physical tests of structural steel as required by Architect. Perform ultrasonic tests on members as determined by Architect to determine if delamination defects in steel members are evident.
8. High-strength bolting testing and inspection shall conform to the following requirements:
  - a. Perform pre-installation verification of pretensioned bolts per RCSC Section 7.1 for the selected pretensioning method.
  - b. Inspect bolted joints per RCSC Section 9 and CBC Section 1705A.2.1.
  - c. All fasteners failing to meet the specified tension shall be examined to determine the cause of failure and re-tested.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Beginning of installation means erector accepts existing conditions.
- C. Bolts shall be clean and free of grease, oil, and all other deleterious substances.

### 3.2 ERECTION

- A. Allow for erection loads and for sufficient temporary bracing to maintain structure safe, plumb and in true alignment, until completion of erection and installation of permanent bracing.
- B. Field weld components indicated on shop drawings.
- C. Do not field cut or alter structural members without acceptance of Architect and DSA.
- D. After erection, prime welds, abrasions and surfaces not shop primed, except surfaces to be in contact with concrete.
- E. Setting Base Plates:
  1. Clean concrete bearing surfaces and roughen to improve bond. Clean the bottom surface of base plates.

2. Set loose and attached base plates for structural members on steel shim plates or adjusting nuts at anchor bolts.
  3. Tighten anchor bolts after the supported members have been positioned and plumbed. Do not remove adjusting nuts or shim plates.
  4. Place non-shrink grout solidly between surfaces as shown to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow non-shrink grout to cure.
- F. Structural steel work shall be set accurately at established lines and levels. Steel shall be plumb and level before final bolting or welding is commenced and after complete erection. All cutting, notching, coping, etc., required for proper assembly and fitting of parts and members, shall be done by the steel fabricator. Such workmanship shall be equal in quality to shop work.
1. Coordinate the erection of structural steel with other trades and locate temporary guys, braces, falsework, and cribbing as may be necessary for erection so as not to interfere with the progress of other work.
  2. Rolled sections, except for minor details, shall not be heated except for welding operations.
  3. Upon acceptance by Architect, gas cutting may be permitted if the metal being cut is not highly stressed during the operation. Stresses shall not be transmitted through a flame cut surface unless such surfaces are cut by a mechanically guided torch. The radius of re-entrant flame cut fillets shall be as large as possible, but not less than 1 inch. To determine the net area of members so cut, 1/8 inch shall be deducted from the flame cut edges not made by a mechanically guided torch. Gas cuts shall be smooth and regular. Holes for bolts shall not be cut with a torch.
  4. All contact surfaces shall be cleaned before assembly.
  5. Provide setting diagrams and templates as required. Placement of beam connectors shall be the responsibility of structural steel fabricator.
  6. Splice members only where indicated.
- G. Connections shall be as specified in this Section. In addition, bolted connections shall conform to the following requirements:
1. Beveled washers shall be used under all bolt heads and nuts where they rest on beveled surfaces.
  2. Bolted connectors shall have hexagon heads and nuts.
  3. Nuts shall be drawn up tight. Check threads of unfinished bolts with chisel or approved self-locking nuts.
  4. Bolts that have been completely tightened shall be marked with identifying symbol.
- H. Framing shall be carried up true and plumb. Temporary bracing shall be introduced wherever necessary to take care of all loads to which structure may be subjected, including erection equipment and its operation. Such bracing shall be left in place as long as may be required for safety. It shall finally be removed by Contractor as part of his equipment. As erection progresses, the work shall be securely connected to take care of all dead load, lateral loads, and erection stresses. No final bolting or welding shall be done until the structure has been properly aligned.

### 3.3 ERECTION TOLERANCES

- A. Level and plumb steel within the tolerances defined in the AISC Code of Standard Practice, latest edition. Erection tolerances shall be reduced as required for acceptance of subsequent work.

### 3.4 REPAIRS AND PROTECTION

- A. Repair ungalvanized sections and damaged galvanized coatings using a zinc-rich paint in accordance with ASTM A780 with at least 92 percent zinc by weight in dried film.
- B. Touch-Up Painting: After installation, promptly clean, prepare, and prime or re-prime field connections, rust spots, abraded surfaces of prime-painted joists and accessories, and abutting structural steel.
  - 1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
  - 2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

### 3.5 CLEAN-UP

- A. Upon completion of the work of this Section, remove all surplus materials, rubbish, and debris from premises.

END OF SECTION



## SECTION 07 92 00

### JOINT SEALANTS

#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Sealants.
- B. Sealant accessories.

##### 1.2 RELATED SECTIONS

- A. Section 08 11 13 – Hollow Metal Doors and Frames.
- B. Section 08 41 13 – Aluminum-Framed Entrances and Storefronts.
- C. Section 08 81 00 – Glass Glazing.
- D. Section 09 29 00 – Gypsum Board.

##### 1.3 REFERENCES

- A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.
- B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.
- C. Referenced Standards:
  - 1. ASTM C510 – Standard Test Method for Staining and Color Change of Single- or Multicomponent Joint Sealants.
  - 2. ASTM C719 – Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle).
  - 3. ASTM C794 – Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.
  - 4. ASTM C834 – Standard Specification for Latex Sealants.
  - 5. ASTM C881 – Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
  - 6. ASTM C919 – Standard Practice for Use of Sealants in Acoustical Applications.
  - 7. ASTM C920 – Standard Specification for Elastomeric Joint Sealants.
  - 8. ASTM C1087 – Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems.
  - 9. ASTM C1193 – Standard Guide for Use of Joint Sealants.
  - 10. ASTM C1248 – Standard Test Method for Staining of Porous Substrate by Joint Sealants.
  - 11. ASTM C1311 – Standard Specification for Solvent Release Sealants.

12. ASTM C1521 – Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints.

13. ASTM D2203 – Standard Test Method for Staining from Sealants.

#### 1.4 SUBMITTALS

- A. General: Submit in accordance with Division 01.
- B. Product Data: Submit manufacturer's descriptive literature and product specification for each product, including primers and sealing compounds.
  - 1. Provide manufacturer's literature with selected colors clearly indicated.
- C. Quality Assurance/Control Submittals:
  - 1. Product validation/assurance submittals.
  - 2. Manufacturer's laboratory adhesion and stain testing results.
  - 3. Joint sealants field adhesion to joint substrates test results.
  - 4. Installer qualifications.
  - 5. Written certification from the subcontractor that joints are of the proper size and design, that the materials supplied are compatible with adjacent materials and backing, that the materials will properly perform to provide permanent watertight, airtight or vapor tight seals (as applicable), and that materials supplied meet specified performance requirements.
- D. Sample Manufacturer's Warranty.
- E. Closeout Submittals: Cleaning and maintenance data.

#### 1.5 DEFINITIONS

- A. Sealant Types:
  - 1. S: Single component sealant, cures by moisture reaction.
  - 2. M: Multiple component sealant; cures by chemical reaction.
- B. Sealant Grades:
  - 1. NS: Non-sag or gunnable sealant that permits application in joints on vertical surfaces without sagging or slumping.
  - 2. P: Pourable sealant that has sufficient flow to form a smooth, level surface when applied in a horizontal joint.
  - 3. SL: Self-leveling sealant that has sufficient flow to form a smooth, level surface when applied in a horizontal joint.
- C. Sealant Classes:
  - 1. 12.5: A sealant that when tested for adhesion and cohesion under cyclic movement shall withstand an increase and decrease of at least 12.5 percent of the joint width as measured at the time of application.
  - 2. 25: A sealant that when tested for adhesion and cohesion under cyclic movement shall withstand an increase and decrease of at least 25 percent of the joint width as measured at the time of application.

3. 35: A sealant that when tested for adhesion and cohesion under cyclic movement shall withstand an increase and decrease of at least 35 percent of the joint width as measured at the time of application.
4. 50: A sealant that when tested for adhesion and cohesion under cyclic movement shall withstand an increase and decrease of at least 50 percent of the joint width as measured at the time of application.
5. 100/50: A sealant that when tested for adhesion and cohesion under cyclic movement shall withstand an increase of at least 100 percent and a decrease of at least 50 percent of the joint width as measured at the time of application.

D. Sealant Uses:

1. A: Sealant acceptable for use on an aluminum substrate.
2. G: Sealant acceptable for use on a glass substrate.
3. I: Sealant designed for use in joints which are submerged continuously in a liquid.
  - a. Immersion rated sealant applications require primer.
4. M: Sealant acceptable for use on a mortar substrate.
5. NT: Sealant designed for use in joints in non-traffic areas.
6. T: Sealant designed for use in joints in pedestrian and vehicular traffic areas such as walkways, plazas, decks, and parking garages.
7. O: Sealant acceptable for use on substrates other than those listed above including, but not limited to, color anodized aluminum, metals other than aluminum, painted surfaces, brick, stone, tile, and wood.

E. Miscellaneous:

1. FC: Fast cure sealants; provides lesser cure times than corresponding standard cure sealants.

1.6 SUSTAINABLE DESIGN REQUIREMENTS

- A. Meet VOC requirements of South Coast Air Quality Management District (SCAQMD) Rule 1168. Information is available at [www.aqmd.gov](http://www.aqmd.gov). VOC limit expressed in grams per liter as follows:

| Sealant       | VOC Limit |
|---------------|-----------|
| Architectural | 250       |
| Other         | 420       |

| Sealant Primer            | VOC Limit |
|---------------------------|-----------|
| Architectural – Nonporous | 250       |
| Architectural – Porous    | 775       |
| Other                     | 750       |

- B. Provide sealants with no carcinogen or reproductive toxicant components at more than 1 percent of total mass of product as defined in the following lists:
1. California OEHHA, Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65). Information is available at [www.oehha.ca.gov/prop65.html](http://www.oehha.ca.gov/prop65.html).
  2. California Air Resources Board (CARB), list of Toxic Air Contaminants (California Air Toxics). Information is available at [www.arb.ca.gov/toxics](http://www.arb.ca.gov/toxics).

## 1.7 QUALITY ASSURANCE

### A. Qualifications:

1. Manufacturer Qualifications: Firm specializing in manufacturing products specified in this Section.
2. Applicator Qualifications: Firm specializing in installing work specified in this Section with experience on at least 5 projects of similar nature in past three years.

### B. Product Validation/Assurance: Provide products with current SWRI Validation or provide independent third-party laboratory test results showing product meets performance requirements in accordance with ASTM C920 and as specified in this Section.

### C. Compatibility: Materials forming joints and adjacent materials shall not adversely affect sealant materials or sealant color per ASTM C1087.

### D. Staining: Sealants shall not stain joint substrates per ASTM C510, ASTM C1248, and ASTM D2203.

### E. Manufacturer Adhesion, Cohesion, and Stain Testing: Provide manufacturer's laboratory adhesion and cohesion testing per ASTM C719 and ASTM C794, and stain testing per ASTM C510, using specimens of actual substrates to ensure sealant compatibility with substrate before product acceptance.

### F. Joint Sealants Field Test for Adhesion and Cohesion to Joint Substrates: Perform field tests for each elastomeric joint sealant in accordance with ASTM C1521, with the manufacturer's representative present prior to installation as follows:

1. Install joint sealants in 5 foot joint lengths. Allow sealant to fully cure before testing.
2. Make a knife cut of the sealant across the joint and along each side of the joint approximately 3 inches long.
3. Place a mark on the sealant tab, 1 inch from the adhered joint to the tab's free end.
4. Grasp a 2 inch piece of sealant firmly just beyond the 1 inch mark and pull at a 90 degree angle.
5. Record whether or not sealant in joint maintained adhesion to substrate.
6. Record percentage length of sealant elongation.
7. Sealant product acceptance shall be based on pass/fail adhesion performance.

### G. Coordination: Coordinate work in this Section with work in related Sections.

## 1.8 DELIVERY, STORAGE, AND HANDLING

### A. Comply with requirements of Division 01.

### B. Deliver materials in the unopened, original containers or unopened packages with manufacturer's name, labels, product identification, color, expiration period, curing time, and mixing written instructions for multi-component materials.

### C. Storage and Protection: Store materials in a dry secure location with ambient temperature range of 60 degrees F to 80 degrees F.

### D. Carefully handle and store to prevent inclusion of foreign materials.

## 1.9 PROJECT/SITE CONDITIONS

### A. Environmental Limitations:

1. Do not proceed with installation of primers and joint sealants under the following conditions:
  - a. When ambient and substrate temperature conditions are less than 40 degrees F, or as otherwise recommended by manufacturer.
  - b. When joint substrates are wet.

### B. Joint-Width Conditions:

1. Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

## 1.10 SEQUENCING

- ### A. Apply waterproofing, water repellents, and preservative finishes after sealants have fully cured.

## 1.11 WARRANTY

### A. Comply with provisions of Division 01.

### B. Provide manufacturer's warranty against material defects, air and water tightness, loss of adhesion, cohesion, and staining as follows:

1. Silicone Sealants: Twenty-years.
2. Urethane Sealants: Five-years.
3. Other Sealants: Two-years.

### C. Provide installer's two-year workmanship warranty.

## 1.12 MAINTENANCE DATA

### A. Submit in accordance with Division 01.

### B. Provide cleaning and maintenance information, recommended inspection intervals, and written installation instructions for repairing and replacing failed sealant joints.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

#### A. Acceptable Manufacturers:

1. Hilti, Plano, TX; 800-879-8000, [www.hilti.com](http://www.hilti.com).
2. Pecora Corporation, Harleysville, PA; 800-355-8817, [www.pecora.com](http://www.pecora.com).
3. Sika, Lyndhurst, NJ; 203-933-8800, [usa.sika.com](http://usa.sika.com).
4. Specified Technologies Inc. (STI), Somerville, NJ; 800-992-1180, [www.stifirestop.com](http://www.stifirestop.com).
5. The Euclid Chemical Company, Cleveland, OH; 800-321-7628, [www.euclidchemical.com](http://www.euclidchemical.com).
6. Tremco, Beachwood, OH; 800-321-7906, [www.tremcosealants.com](http://www.tremcosealants.com).

#### B. Substitutions: Under provisions of Division 01.

## 2.2 SEALANTS

### A. General:

1. Provide sealants that have been tested and found suitable for the substrates to which they will be applied.
2. Color: As selected by Architect from manufacturer's full range of colors.

### B. Interior Sealants:

1. Interior Sealant: Nonoxidizing, skinnable, paintable, gunnable, non-staining, non-bleeding acrylic latex sealant; ASTM C834; Type S; Grade NS; Class 12.5; use: O.
  - a. Products:
    - 1) Tremco Tremflex 834.
    - 2) Pecora Corporation AC-20 + Silicone.
    - 3) Or accepted equal.
  - b. Use at interior trim and finish joints expecting minimal movement.
2. Interior Sealant: Low modulus, moisture curing, non-staining, non-bleeding polyurethane sealant; ASTM C920; Type S; Grade NS; Class 35; uses: A, M, NT, O.
  - a. Products:
    - 1) Tremco Dymonic FC.
    - 2) The Euclid Chemical Company Eucolastic 1NS.
    - 3) Sika Sikaflex 1a.
    - 4) Or accepted equal.
  - b. Use at interior vertical expansion, control, and air seal joints.
3. Acoustical Sealant: Non-skinning, non-hardening synthetic rubber sealant; ASTM C919; Type S; Grade NS; use: O.
  - a. Products:
    - 1) Tremco Acoustical Sealant.
    - 2) Pecora Corporation BA-98.
    - 3) Or accepted equal.
  - b. Use at concealed joints and penetrations in interior acoustical walls.
4. Acoustical Sealant: Nonoxidizing, skinnable, paintable, gunnable, non-staining, non-bleeding acrylic latex sealant; ASTM C834 and C919; Type S; Grade NS; Class 12.5; use: O.
  - a. Products:
    - 1) Tremco Tremflex 834.
    - 2) Pecora Corporation. AC-20 FTR.
    - 3) Specified Technologies Inc. (STI) LC or SpecSeal Smoke N Sound Sealant.
    - 4) Hilti CS-S SA Light.
    - 5) Or accepted equal.
  - b. Use at exposed joints and penetrations in interior acoustical walls.

## 2.3 ACCESSORIES

- A. Joint Cleaner: Non-corrosive and non-staining type as recommended by sealant manufacturer; compatible with joint forming materials.
- B. Primers: Non-staining, quick-drying type and consistency recommended by the sealant manufacturer for the particular application.
- C. Joint Backing: Non-adhering backing to sealant; non-staining, compatible with sealant and primer such as round, closed cell or bi-cell polyethylene foam rod; oversized 25 percent to 50 percent larger than joint width. Materials impregnated with oil, bitumen, or similar materials are not permitted.
- D. Bond Breakers: Type and consistency recommended by the sealant manufacturer to suit the particular application.
- E. Bond Breaker Tape: Self-adhesive, pressure sensitive polyethylene tape.
- F. Masking Tape: Non-staining, non-absorbent tape compatible with joint sealants and adjacent joint surfaces.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Examine job site conditions; verify substrate, surfaces, and joint openings are ready to receive work and field measurements are as shown on drawings, as specified in this Section, and as recommended by manufacturer.
- B. Report unacceptable conditions to Architect. Begin installation only when unacceptable conditions have been corrected.

### 3.2 PREPARATION

- A. Clean, prepare, and prime joints in accordance with ASTM C1193 and manufacturer's written installation instructions.
- B. Remove loose materials and foreign matter that might impair sealant adhesion. Clean porous materials such as concrete by grinding, sand, or water blast cleaning, mechanical abrading, acid washing, or a combination of these methods as required to provide a clean, sound base surface for sealant adhesion.
  - 1. Remove laitance by acid washing, grinding, or mechanical abrading.
  - 2. Remove form oils, release agents, chemical retardants, by sand, or water blast cleaning.
  - 3. Blow from joints with oil-free compressed air loose particles resulting from grinding, abrading, or blast cleaning prior to sealant application.
- C. Mechanically or chemically clean nonporous surfaces such as metal and glass. Remove temporary protective coatings on metallic surfaces using solvents that leave no residue as recommended by metal surface manufacturer. When masking tape or strippable films are used, remove the tape or film, and clean any residual adhesive. Apply and wipe-dry cleaning solvents using clean, lint-free cloths or paper towels, do not allow solvent to air dry without wiping.

- D. Protect elements surrounding the work of this Section from damage or disfiguration. Apply masking tape to adjacent surfaces to prevent damage to finishes from sealant installation.

### 3.3 APPLICATION

- A. Apply sealant where indicated on the Drawings.
- B. Apply sealants in accordance with ASTM C1193, manufacturer's written installation instructions.
- C. Apply acoustical sealants in accordance with ASTM C919, manufacturer's written installation instructions, except where more stringent requirements are specified herein.
- D. Measure joint dimensions and size materials to achieve required width-to-depth ratios. Acceptable joint width-to-depth ratios:

| Material                           | Joint Width          | Joint Depth                             |          |
|------------------------------------|----------------------|-----------------------------------------|----------|
|                                    |                      | Minimum                                 | Maximum  |
| Metal or other nonporous surfaces. | 1/4 inch (minimum)   | 1/4 inch                                | 1/4 inch |
|                                    | Over 1/4 inch        | 1/2 of width                            | 1/2 inch |
| Concrete or other porous surfaces. | 1/4 inch (minimum)   | 1/4 inch                                | 1/4 inch |
|                                    | Over 1/4 inch        | 1/2 of width                            | 1/2 inch |
|                                    | Over 1/2 to 2 inches | 1/2 inch                                | 1/2 inch |
|                                    | Over 2 inches        | As recommended by sealant manufacturer. |          |

- E. Install joint backing to achieve desired joint width-to-depth ratio. Roll the material into the joint to avoid lengthwise stretching. Do not twist or braid rod stock.
- F. Install bond breaker where joint backing is not used to prevent three-sided adhesion.
- G. Apply primer where required and where recommended by sealant manufacturer for sealant adhesion.
- H. Install sealants within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- I. Install sealants immediately after joint preparation.
- J. Install sealants free of air pockets, foreign embedded matter, ridges, and sags.
- K. Produce uniform, cross sectional shapes, and depths relative to joint width that allow optimum sealant movement capability.
- L. Tool joints concave. Use dry tooling method.
- M. Cure sealants in compliance with their manufacturer's written installation instructions to obtain high early bond strength, internal cohesive strength, and durability. Do not disturb seals until completely cured.

### 3.4 CLEANING AND REPAIRING

- A. Immediately clean work under provisions of Division 01.

B. Clean adjacent soiled surfaces. Use a cleaning agent as recommended in writing by the sealant manufacturer. Remove any masking tape immediately after tooling joints, leaving finished work in neat and clean condition.

C. Repair or replace defaced or disfigured caused by work of this Section.

### 3.5 PROTECTION OF FINISHED WORK

A. Protect finished installation under provisions of Division 01.

B. Protect sealant until cured.

C. Do not paint sealants until sealant is fully cured.

D. Do not paint silicone sealant.

E. Protect joint sealants from contact with contaminating substances and from damage. Cut out, remove, and replace contaminated or damaged sealants, immediately, so that they are without contamination or damage at time of Project Completion.

END OF SECTION



SECTION 08 11 13  
HOLLOW METAL DOOR FRAMES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Hollow metal door frames, non-rated.
- B. Transoms.
- C. Glazing.

1.2 RELATED SECTIONS

- A. Section 07 92 00 – Joint Sealants.
- B. Section 08 14 00 – Wood Doors.
- C. Section 08 71 00 – Door Hardware.
- D. Section 08 81 00 – Glass Glazing.
- E. Section 09 22 16 – Non-Structural Metal Framing.
- F. Section 09 29 00 – Gypsum Board.
- G. Section 09 91 00 – Painting.

1.3 REFERENCES

- A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.
- B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.
- C. Referenced Standards:
  - 1. ANSI/SDI A250.6 – Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
  - 2. ANSI/SDI A250.8 – Specifications for Standard Steel Doors and Frames.
  - 3. ANSI/SDI A250.11 – Recommended Erection Instructions for Steel Frames.
  - 4. ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - 5. ASTM A1008/A1008M – Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable.

- 6. 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.
- 7. ASTM E283 – Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- 8. ANSI/NAAMM HMMA 861 – Guide Specifications for Commercial Hollow Metal Doors & Frames.
- 9. NFRC 400 – Procedure for Determining Fenestration Product Air Leakage.

#### 1.4 SUBMITTALS

- A. Submit under provisions of Division 01.
- B. Shop Drawings: Include illustrations and schedule of finish hardware, door frame size, type, material, construction, finishing, anchoring, glazing, accessories, and preparation for installing hardware.
  - 1. Method of attachment of frames to structure shall be reviewed by Architect for acceptance or rejection.
- C. Templates: Furnish hardware templates to fabricator of frames to be factory prepared for installation of hardware. Refer to Section 08 71 00 for hardware requirements.
- D. Submit product data for type of metal primer proposed for use.

#### 1.5 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings.
- B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

#### 1.6 QUALITY ASSURANCE

- A. Steel door frame manufacturer shall be SDI certified.
- B. Provide door frames complying with ANSI A250.8, ANSI/NAAMM-HMMA 861, and as specified herein.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver all materials under protective cover and store in upright position within a dry enclosed space in a manner that will prevent rust and damage. Do not create a humidity chamber by using a plastic or canvas shelter that is not adequately vented.
- B. Deliver fully-welded frames with 2 removable spreader bars across bottom of door frames, tack welded to jambs and mullions.

#### 1.8 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

## 1.9 COORDINATION

- A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

## 1.10 WARRANTY

- A. For a period of one year from the date of delivery to the original direct purchaser, manufacturer warrants to the original direct purchaser that it will at its option, either repair, replace or otherwise correct any product acknowledged by the manufacturer to be defective in materials or workmanship.

# PART 2 PRODUCTS

## 2.1 MANUFACTURERS

- A. Acceptable Manufacturers, Hollow Metal Door Frames:
  - 1. Ceco Door Products, Milan, TN; 888-264-7474, [www.cecodoor.com](http://www.cecodoor.com).
  - 2. Curries, a Brand of Assa Abloy, Mason City, IA; 641-423-1334, [www.curries.com](http://www.curries.com).
  - 3. Steelcraft, Cincinnati, OH; 877-671-7011, [www.steelcraft.com](http://www.steelcraft.com).
  - 4. DCI Hollow Metal on Demand, Fontana, CA; 909-770-5700, [www.dcihollowmetal.com](http://www.dcihollowmetal.com).
- B. Substitutions: Under provisions of Division 01.

## 2.2 MATERIALS

- A. Cold-Rolled Steel Sheets for Door Frames: Commercial Steel (CS), Type B, complying with ASTM A1008/A1008M.
  - 1. Use cold-rolled steel for door frames and exposed-to-view surfaces.
- B. Hot-Rolled Steel Sheets and Strip for use at Door Frames: Commercial Steel (CS), Type B; complying with ASTM A1011/A1011M.
  - 1. Steel shall be free of mill scales, pitting, or surface defects; pickled and oiled.
  - 2. Use hot-rolled steel for reinforcement and concealed components only.
- C. Factory-Applied Primer: Manufacturer's standard primer, thickness: 2 mils minimum, and compatible with ferrous metal primers specified in Section 09 91 00.
- D. Refer to Section 08 81 00 for glass glazing requirements.
- E. Refer to Section 08 71 00 for hardware requirements.

## 2.3 FABRICATION – STANDARD HOLLOW METAL FRAME

- A. General:
  - 1. Provide fully welded frames.
  - 2. Hollow metal frames shall be formed to shapes and sizes shown.

- B. Full Profile Welded Frames: Head and jamb splices shall be fabricated with mitered, coped and continuously welded inside and outside corners and be finished on the outside face to present a smooth surface for painting.
- C. Frames shall be fabricated from 16 gauge steel and shall be designed with integral stop and trim. All corners shall be reinforced with 18 gauge L shaped reinforcements welded on the inside face of the frame.
- D. Reinforce frames wider than 48 inches with roll formed steel channels fitted tightly into frame head, flush with top.
- E. Preparation for Hardware: Per ANSI/SDI A250.6, frame shall be prepared at the factory for all hardware using templates furnished by hardware supplier. Locations of miscellaneous hardware shall conform to the recommendations for the Door and Hardware Institute. Mortise, reinforce, drill, and tap for mortise type hardware. Reinforce frames for surface applied hardware; drilling and tapping to be done in the field by door installer.
  - 1. Hardware cutouts shall have steel plate reinforcements with tapped holes fillet welded to frame on all 4 sides of the plate. Fillet welds shall be minimum 1 inch long. Reinforcement shall include 3/16 inch butt reinforcement; 12 gauge lock strike; 14 gauge for surface applied items.
  - 2. Provide strike stops at frames to receive doors with holes for 3 rubber door silencers. On double door frames, provide for 2 silencers per door at head. Omit holes at frames to receive unitized gasketing; refer to Section 08 71 00.

## 2.4 FABRICATION – ANCHORS

- A. Frame shall be anchored to structure with anchors appropriate for use with type of adjacent construction. Anchorage shall securely fasten frames to wall construction involved. Provide a minimum 3 anchors, including 1 adjustable floor clip, at each door jamb. Frames taller than 8 feet in height will require additional anchors at each jamb. Anchors shall be minimum 16 gauge steel and shall provide stiffness and rigidity to keep frames square, in accurate position without twisting, buckling, or warping. Floor clips shall be anchored to the concrete slab using concrete screws by Hilti, Simpson, or accepted equal. Fasteners to wall framing substrate shall be the following minimums; greater as required by the frame manufacturer or as conditions warrant:
  - 1. Metal Framing: Two #10 self-tapping sheet metal screws per anchor, length as required; fastener to penetrate a minimum of 1/4 inch into framing member.

## 2.5 PRIMING

- A. Door frames shall be leveled and welds ground smooth. Apply mineral filler to eliminate weld scars and other blemishes.
- B. Shop Priming: All surfaces shall be cleaned, phosphatized, and given 1 coat of baked-on rust-inhibiting primer in accordance with the Steel Door Institute Specification Test Procedure and Acceptance Criteria for Primer Painted Steel Doors and Frames.

## 2.6 FINISH

- A. Door frames shall be field painted under provisions of Section 09 91 00, color as indicated on Drawings; if not indicated, to be selected by Architect.

## 2.7 ACCESSORIES

- A. Glazing Stops: L-FRA100 by National Guard Products (NGP) ([www.ngp.com](http://www.ngp.com)) or accepted equal. 18 gauge cold-rolled steel; mitered corners; prepared for countersink style screws. Sizes as indicated on Drawings. Install glazing stop fasteners on the non-secure side of doors. Finish shall be factory primed to receive site paint finish, color as selected by Architect.
- B. Glass Glazing: As specified in Section 08 81 00.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that opening sizes and tolerances are acceptable.

### 3.2 INSTALLATION

- A. Install door frames in accordance with ANSI A250.11 and ANSI/NAAMM-HMMA 861, as applicable.
- B. Set frames level and plumb, and brace adequately to prevent damage or distortion. Secure to structure with minimum of 3 anchors at each jamb. Field joints shall be welded, body puttied, and ground smooth.
  - 1. Removable Spreaders: Wherever possible, leave frame spreaders intact until frames are set perfectly square and plumb, and anchors are securely attached.
- C. Door Installation in Hollow Metal Frames: Fit doors accurately in frames.
- D. Coordinate installation of door frames with installation of doors specified in Section 08 14 00, hardware specified in Section 08 71 00, and glazing as specified in Section 08 81 00.

### 3.3 ERECTION TOLERANCES

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

### 3.4 ADJUST AND CLEAN

- A. Prime Coat Touch-Up: Immediately after erection, sand smooth all rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer. Touch-up shall not be obvious.
- B. Cleaning and Finishing: Upon completion of the work, clean all exposed surfaces, removing any discoloration or foreign matter, and touch-up all abraded or cut areas and exposed edges with finishing material recommended by the manufacturer. Touch-up of finish shall not be obvious.
- C. Final Adjustments: Adjust door for smooth and balanced door movement. Check and readjust operating finish hardware in hollow metal work immediately prior to final inspection. Leave work in complete and proper operating condition.
- D. Defective Work: Remove and replace defective work, including door frames which are warped, bowed, or otherwise damaged, as directed by Architect, at no cost to Owner.

- E. Protection: Protect installed hollow metal work against damage from other construction work.

### 3.5 CLEAN-UP

- A. Upon completion of the work of this Section, remove all excess materials, rubbish, and debris from the premises.

END OF SECTION

## SECTION 08 14 00

### WOOD DOORS

#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Non-rated flush wood doors.
- B. Door glazing.

##### 1.2 RELATED SECTIONS

- A. Section 08 11 13 – Hollow Metal Door Frames.
- B. Section 08 71 00 – Door Hardware.
- C. Section 08 81 00 – Glass Glazing.
- D. Section 09 91 00 – Painting.

##### 1.3 REFERENCES

- A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.
- B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.
- C. Referenced Standards:
  - 1. ANSI/WDMA I.S. 1A – Interior Architectural Wood Flush Doors.

##### 1.4 SUBMITTALS

- A. Submit under provisions of Division 01.
- B. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, special beveling, special blocking for hardware, and identify cutouts for glazing.
- C. Product Data: Submit product data for each product specified in this Section with the product and selected attributes clearly identified, including veneer species and cut, factory machining criteria, and factory finishing criteria.
- D. Samples:
  - 1. Submit 2 sets of 3 samples each of door veneer, 8 inches x 8 inches in size, illustrating specified wood species, grain, finish, and range of color.

##### 1.5 QUALITY ASSURANCE

- A. Single Source Responsibility: All doors specified in this Section shall be manufactured and provided by a single manufacturer to ensure door compatibility and quality.

B. Perform work in accordance with WI/AWMAC, Section 9, Custom Grade.

C. Other requirements shall conform to WDMA I.S. 1A-04 as follows:

| Performance Attribute                                 | Duty Level                                                   |
|-------------------------------------------------------|--------------------------------------------------------------|
|                                                       | Extra Heavy-Duty                                             |
| Adhesive Bond Durability WDMA TM-6, 1988              | Type I                                                       |
| Cycle Slam WDMA TM-7, 1990                            | 1, 000,000 cycles                                            |
| Hinge-Loading WDMA TM-8, 1990                         | 550 pounds                                                   |
| Screwholding WDMA TM-10, 1990                         |                                                              |
| Door Face Unblocked                                   | 550 pounds                                                   |
| Door Face (with optional blocking)                    | 700 pounds                                                   |
| Vertical Door Edge                                    | 550 pounds                                                   |
| Horizontal Door Edge (applies when hardware attached) | 300 pounds                                                   |
| Telegraph WDMA T-1                                    | Maximum 0.010 inch per 3-inch span                           |
| Warp Tolerance WDMA T-2                               | Maximum 0.25 inch per 3 foot 6 inches by 7 foot door section |
| Squareness WDMA T-3                                   | Diagonal Variance 0.125 inch                                 |

## 1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this Section.

## 1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products to site under provisions of Division 01.

B. Accept doors on site in manufacturer's packaging. Inspect for damage.

C. Comply with requirements in ANSI/WDMA I.S. 1A: How to store, handle, finish, install, and maintain wood doors.

D. In the event of damage, immediately make all repairs and replacements necessary at no additional cost to Owner.

E. Store flat on a level surface in a dry, well-ventilated building. Cover to keep clean but allow air circulation.

F. Handle with clean gloves and do not drag doors across one another or across other surfaces.

G. Do not subject door to abnormal heat, dryness, or humidity.

H. Deliver in clean trucks and, in wet weather, under cover.

## 1.8 FIELD MEASUREMENTS

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

## 1.9 COORDINATION

- A. Coordinate the work with door opening construction, door frame, door hardware, and door glazing installation.

## 1.10 WARRANTY

- A. Provide warranty under provisions of Division 01.
- B. Warranty Period:
  - 1. Interior Solid Core Standard Doors: Life of installation.
  - 2. Include coverage for delamination of veneer, warping or twisting (not to exceed 1/4 inch in any face including diagonal) or other defects. Warranty shall cover replacement of door plus costs of hanging and finishing.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
  - 1. Oregon Door, Winston, OR; 541-679-6791, [www.oregondoor.com](http://www.oregondoor.com).
  - 2. VT Industries, Holstein, IA; 800-827-1615, [www.vtindustries.com](http://www.vtindustries.com).
  - 3. Lynden Door, Inc, Lynden, WA; 800-631-3667, [www.lyndendoor.com](http://www.lyndendoor.com).
- B. Substitutions: Under provisions of Division 01.

### 2.2 DOOR CONSTRUCTION

- A. All doors shall be 1-3/4 inch thickness, unless noted otherwise.
- B. Solid, non-rated particleboard core: WI/AWMAC Section 9, 5-ply; Custom Grade.
- C. Faces:
  - 1. Veneer Species: Stain grade select veneer for transparent finish. Species to match existing.
  - 2. Cut: Match existing.
  - 3. Grade: A Grade.
  - 4. Match Between Veneer Leaves: Book match.
  - 5. Assembly of Veneer Leaves on Door Faces: Balance match.
  - 6. Face veneers shall not be less than 1/50 inch at 12 percent moisture content after factory sanding. Crossbanding shall be one-piece high density fiberboard (HDF), MDF will not be allowed as a veneer substrate (crossband). Thin veneers are not acceptable.
  - 7. Use solid stock for exposed edges to match face veneer.
- D. Provide solid blocking on doors with surface mounted hardware or closers, for attachment with screws in lieu of through-bolts.
- E. Top and bottom rails shall be a minimum of 2-1/4 inch before trimming, mill option species structural composite lumber for non-rated doors.

## 2.3 ADHESIVE

- A. Facing Adhesive: Type I – waterproof.

## 2.4 ACCESSORIES

- A. Glazing Stops: L-FRA100 by National Guard Products (NGP) or accepted equal. 18 gauge cold-rolled steel; mitered corners; prepared for countersink style screws. Sizes as indicated on Drawings. Install glazing stop fasteners on the non-secure side of doors. Finish shall be factory primed to receive site paint finish; color as selected by Architect.
- B. Glass Glazing: As specified in Section 08 81 00.

## 2.5 FABRICATION

- A. Fabricate doors in accordance with WI/AWMAC North American Architectural Woodwork Standards requirements.
- B. Provide blocking at top of door for closer for attachment with screws.
- C. Bond edge banding to cores.
- D. Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware.
- E. Undercut doors where indicated on Drawings.
- F. Glass Cutouts: Provide cutouts for glass of size and shape indicated. Glass for doors is specified under Section 08 81 00.
- G. Factory seal top and bottom rails before shipment.
- H. Bevel both stiles 1/8 inch in 2 inches (3 degree bevel) and undersize doors 1/4 inch in width so that they swing freely and do not hinge bind.

## 2.6 FINISH

- A. All doors shall be factory pre-finished, equal to WI/AWMAC Section 5, System #3, or accepted equal. Transparent finish: custom stain color and tone as selected by Architect and accepted on submitted samples. Apply finish at all faces and edges of doors.

# PART 3 EXECUTION

## 3.1 EXAMINATION

- A. Verify frame opening conditions.
- 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.

## 3.2 INSTALLATION

- A. Install doors in accordance with WI/AWMAC Section 9 requirements.

- B. Pre-adjust door height, supply doors with factory undercut.
- C. Where required, trim door width by cutting equally on both jamb edges.
- D. Where required, trim door height by cutting bottom edge to a maximum of 1/2 inch above finished floor or threshold.
- E. Pilot drill screw and bolt holes.
- F. Machine cut for hardware. Core for handsets and cylinders.
- G. Coordinate installation of doors with installation of frames specified in Section 08 11 13, hardware specified in Section 08 71 00, and glazing as specified in Section 08 81 00.

### 3.3 INSTALLATION TOLERANCES

- A. Maximum Diagonal Distortion (Warp): 1/4 inch measured with straight edge or taut string, corner to corner, over an imaginary 36 inch x 84 inch surface area.
- B. Maximum Vertical Distortion (Bow): 1/4 inch measured with straight edge or taut string, top to bottom, over an imaginary 36 inch x 84 inch surface area.

### 3.4 ADJUSTING

- A. Adjust work under provisions of Division 01.
- B. Adjust door for smooth and balanced door movement, and wipe clean.

END OF SECTION



SECTION 08 36 29  
OVERHEAD FOLDING DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Overhead folding doors.

1.2 RELATED SECTIONS

- A. Section 05 12 00 – Structural Steel Framing.
- B. Section 07 92 00 – Joint Sealants.
- C. Section 08 71 00 – Door Hardware: Cylinder locks.
- D. Division 26 – Electrical: Empty conduit from control station to door operator and wiring connections to door operator.

1.3 REFERENCES

- A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.
- B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.
- C. Referenced Standards:
  - 1. AAMA 611 – Specification for Anodized Architectural Aluminum.
  - 2. ANSI/NFRC 100 – Procedure for Determining Fenestration Product U-Factors.
  - 3. ANSI/NFRC 200 – Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.
  - 4. ASCE/SEI 7 – Minimum Design Loads and Associated Criteria for Buildings and Other Structures.

1.4 SUBMITTALS

- A. Submit under provisions of Division 01.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Written preparation installation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation methods.
- C. Shop Drawings: Indicate plans and elevations including opening dimensions and required tolerances, accessories and anchors, jamb details, connection details, anchorage spacing, hardware locations, and installation details.
- D. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

E. Operation and Maintenance Data.

F. Submit written agreement in manufacturer's standard form signed by manufacturer and installer agreeing to repair or replace defective doors that are warped, twisted, bowed, or damaged as a result of defective product.

#### 1.5 PERFORMANCE REQUIREMENTS

A. Comply with structural design criteria for the project location in accordance with 2025 California Building Code (CBC) and as noted in the Structural Drawings.

#### 1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this Section with minimum five years' experience.

B. Installer Qualifications: Authorized representative of the manufacturer with minimum five years' experience.

C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc. acceptable to DSA as suitable for purpose specified.

D. Single-Source Responsibility: Provide doors, tracks, motors, installation, and accessories from one manufacturer. Provide secondary components from source acceptable to manufacturer of primary components.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened labeled packaging until ready for installation.

B. Store materials in a clean, dry, ventilated, weather tight, secure location.

C. Protect materials from soiling, abuse, loss, and moisture damage.

#### 1.8 PROJECT CONDITIONS

A. Pre-Installation Conference: Convene a pre-installation conference just prior to commencement of field operations, to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.

B. Environmental Conditions: Prior to and during installation, environmental conditions shall be in accordance with door manufacturers latest published recommendations for temperature, rain, wind, humidity, ventilation, and illumination.

#### 1.9 WARRANTY

A. Manufacturer warrants to the original purchaser within one year from date of installation, if a product sold under this warranty proves to be defective in material or workmanship through normal use and service according to written maintenance, operations, and installation instructions, as verified by inspection by persons authorized by door manufacturer, door manufacturer will replace or repair (at door manufacturer's option) the defective product.

B. Manufacturer warrants the steel frame against rust, in painted non-damaged condition for a period of two years from original purchase. This warranty does not apply to scratched, dented, damaged or corroded areas of the frame.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

#### A. Acceptable Manufacturers:

1. Basis of Design: Renlita Doors North America, LLC, Bonham, TX; 903-583-7500, [www.renlitadoors.com](http://www.renlitadoors.com). Product: Sovereign accordion stacking door.
2. CornellCookson, LLC., Mountain Top, PA; 800-233-8366, [www.cornellcookson.com](http://www.cornellcookson.com). Product: VertiStack Clear.

#### B. Substitutions: Under provisions of Division 01.

### 2.2 FOLDING OVERHEAD DOORS

#### A. Doors: Vertically gliding door with no floor tracks.

#### B. Aluminum Curtain: Constructed from 2-1/2 inch by 1-1/2 inch top and side rails and 1-1/4 inch by 1-1/2 inch mid rails.

1. Glass: 1/4 inch thick clear laminated glass, tempered where required by CBC and where indicated on Drawings. Refer to Section 08 81 00.

#### C. Panels: Panels shall be secured by glazing bead, santoprene, or PVC wedges.

1. Panel Heights: Even division of the open height equaling 5 rows, not to exceed 24 inches per panel height.

#### D. Brackets and Tracks: Mono section configuration.

#### E. Side Guides: 5-1/2 inch by 2-3/8 inch extruded aluminum sections with twin 1/8 inch tracks.

#### F. Hardware/Hinges: Cast stainless steel constructed hinges with teflon inserts to ensure quiet and low friction operation.

#### G. Electric Operation: Door shall be balanced by the use of torsion springs connected to a rotating shaft. The shaft ends are attached to cable drums which lift/lower the curtain via a flexible cable.

#### H. Size: As indicated on Drawings.

#### I. Locking:

1. Centrally mounted, two-way mortise key lock.
2. Integrated motor controlled lock assembly.

### 2.3 FINISHES

#### A. Finish, Ferrous Metals: All surfaces except working machine parts shall receive the following factory applied finish:

1. Powder coating.
2. Abrasive clean to SSP-SP6.

#### B. Finish, Aluminum: Provide the following factory applied finish:

1. All aluminum extrusions shall have Architectural Class II finish per Aluminum Association Standard AA-M12 C22 A31, clear anodized, complying with AAMA 611, 0.4 mil minimum thickness.

## 2.4 MOTORS

- A. Renlita Electric Direct Drive (REDD) helical worm geared motor with the following characteristics:
  - 1. Direct mount gearbox.
  - 2. 34 RPM shaft speed, adjustable from WiFi enabled device.
  - 3. Torque: 1200 lb/in.
  - 4. Motor Speed: 1690 RPM.
  - 5. Temperature Range: Negative 15 degrees F to 125 degrees F.
  - 6. Motor Electrical: One horsepower, 110V AC, single phase, 8.0 amps.
  - 7. Controller: NEMA 3 rated enclosure, passcode protected touchscreen wall controller station with open/close/stop functions.
  - 8. Control Panel Dimensions: 12 inches x 8 inches x 7 inches.
  - 9. Soft start and stop function which allows door to ease into the open and closed positions.
  - 10. Safety:
    - a. REDD Alert automatic obstruction sensing system.
    - b. Photo eyes on each side of the opening shall use through beam technology to ensure door does not close on objects obstructing its path. If an obstruction is detected, the motor shall reverse its operation.
  - 11. Locking: Electromagnetic brake shall engage when motor stops to lock door into position.
  - 12. Smartphone programmable.
- B. Doors shall be electronically operated with control systems.
- C. Provide electrical service and wiring connection as specified in Division 26 for electric operation.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Do not begin installation until openings have been properly prepared.
- B. Verify wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.
- C. Verify electric power is available and of correct characteristics.
- D. If preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

### 3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.

- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

### 3.3 INSTALLATION

- A. Inserts and Anchorages: Furnish inserts and anchoring devices suitable for the installation of the units and consistent with the manufacturer's installation requirements. Coordinate delivery with other work to avoid delay.
- B. Install overhead doors, operating equipment, hardware, seals, stops, anchors, inserts, supports, and track in accordance with approved shop drawings and the manufacturer's written installation instructions.
- C. Coordinate installation with adjacent work to ensure proper clearances and allow for maintenance.
- D. Anchor assembly to wall construction and building framing without distortion or stress.
- E. Securely brace door tracks suspended from structure. Secure tracks to structural members only.
- F. Fit and align door assembly including hardware.
- G. Coordinate installation of electrical service. Complete power and control wiring from disconnect to unit components.

### 3.4 CLEANING AND ADJUSTING

- A. Lubricate, test and adjust door assembly to smooth operation free from warp twist or distortion and in full contact with weatherstripping.
- B. Clean doors, frames, and glass.
- C. Remove temporary labels and visible markings.

### 3.5 PROTECTION

- A. Do not permit construction traffic through overhead door openings after adjustment and cleaning.
- B. Protect installed products until completion of project.
- C. Touch-up, damaged coatings and finishes and repair minor damage before Project Completion.

### 3.6 MAINTENANCE

- A. Post-Installation Maintenance:
  - 1. Contractor and door manufacturer's representative shall provide Owner with complete company name, address, phone number, fax number and assigned contact for emergency repairs and scheduled maintenance for the installed door(s).
- B. Training/Instruction for Owner for Operation and System Maintenance:
  - 1. Door manufacturer's representative shall instruct Owner's representative in regular maintenance and operation of installed doors.

END OF SECTION



## SECTION 08 41 13

### ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Interior aluminum storefront system.
- B. Aluminum and glass doors.
- C. Vision glass.
- D. Perimeter sealant.

##### 1.2 RELATED SECTIONS

- A. Section 07 92 00 – Joint Sealants.
- B. Section 08 71 00 – Door Hardware.
- C. Section 08 81 00 – Glass Glazing.
- D. Section 09 22 16 – Non-Structural Metal Framing.

##### 1.3 REFERENCES

- A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.
- B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.
- C. Referenced Standards:
  - 1. AAMA SFM-1 – Aluminum Storefront and Entrance Manual.
  - 2. AAMA 611 – Specification for Anodized Architectural Aluminum.
  - 3. ASTM A36/A36M – Standard Specification for Carbon Structural Steel.
  - 4. ASTM B209/B209M – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
  - 5. ASTM B221/B221M – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

##### 1.4 SUBMITTALS

- A. Submit under provisions of Division 01.
- B. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, and anchor type, size, and spacing.

- C. Product Data: Submit product data for each product specified in this Section with the product and selected attributes clearly identified.
- D. Submit samples for selection, 6 inches minimum in size, illustrating pre-finished aluminum surface in quantity and variety of finish as required to match to existing.

#### 1.5 SYSTEM DESCRIPTION

- A. Aluminum storefront system includes shop fabricated, factory pre-finished tubular aluminum sections and doors, glass, related flashings, anchorage, and attachment devices.

#### 1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with AAMA SFM-1.
- B. These requirements establish standards of design and quality for material, construction and workmanship. When substitute products of equal quality are to be submitted, Contractor shall submit for consideration supporting technical literature, samples, drawings and performance data so these items may be evaluated.
- C. The approved manufacturer's recommended installation procedures will become the basis for inspecting or rejecting actual installation procedures used on the work.
- D. Single Source Responsibility: Provide storefront system, doors, and accessories produced as standard products of one single manufacturer.

#### 1.7 QUALIFICATIONS

- A. Manufacturer and Installer: Company specializing in manufacturing aluminum glazing systems.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect, and handle products to site under provisions of Division 01.
- B. Protect pre-finished aluminum surfaces with strippable coating. Do not use adhesive papers or sprayed coatings that bond when exposed to sunlight or weather.

#### 1.9 WARRANTIES

- A. Storefront System and Doors:
  - 1. Provide written warranty in form acceptable to Owner jointly signed by manufacturer, installer and Contractor warranting work to be watertight, free from defective materials, defective workmanship, glass breakage due to defective design, and agreeing to replace components which fail within two years from date of Project Completion.
  - 2. Warranty shall cover following:
    - a. Complete system installation within specified tolerances.
    - b. System is structurally sound and free from distortion.
- B. Finish:
  - 1. Finished coating system specified in this Section, as applied over aluminum extrusions, shall be warrantied for a period of ten years from date of Project Completion.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

#### A. Acceptable Manufacturers:

1. Kawneer Company, Inc., Norcross, GA; 770-449-5555, [www.kawneer.com](http://www.kawneer.com). Product: Trifab VG 451 storefront, center loaded, with Series 350 Medium Stile doors.
2. Oldcastle Building Envelope, Terrell, TX; 866-653-2278, [www.obe.com](http://www.obe.com).
3. Arcadia Incorporated, Vernon, CA; 323-771-9819, [www.arcadiainc.com](http://www.arcadiainc.com).
4. EFCO, a Division of Apogee Architectural Metals, Wausau, WI; 800-221-4169. [apogeeearchmetals.com](http://apogeeearchmetals.com).

#### B. Substitutions: Under provisions of Division 01.

### 2.2 MATERIALS

- A. Extruded Aluminum: ASTM B221; 6063 alloy, T6 temper. Wall thickness shall provide structural strength to meet specified performance requirements.
- B. Sheet Aluminum: ASTM B209.
- C. Fasteners: Stainless steel.
- D. Perimeter Anchors: Stainless steel.

### 2.3 DOORS

- A. Doors: Corner construction shall consist of mechanical clip fastening, SIGMA deep penetration and minimum 1-1/8 inch long fillet welds. Glazing stops shall be snap-in type with EPDM flashing gaskets. Medium stiles and top rails; bottom rail shall be 10 inches high.
  1. Hardware: As specified in Section 08 71 00. Hardware shall be installed at the factory prior to shipment.
  2. Thresholds: Thresholds shall be one-piece thresholds in a bed of mastic. Threshold shall set no higher than 1/2 inch from the lowest floor surface. When complete, threshold shall be accessible.
- B. Weatherstrip: Door manufacturer's standard felt insert strip designed into door system along perimeter door edges.

### 2.4 ACCESSORIES

- A. Flashings and Closures: 0.050 inch thick aluminum, finish to match window wall system finish where exposed.
- B. Mullion Mate: Where framed partitions abut storefront systems, provide Mullion Mate closure as manufactured by Gordon Incorporated, Bossier City, LA; 800-747-8954, [www.gordon-inc.com](http://www.gordon-inc.com) or accepted equal. Mullion Mate finish shall match storefront system finish. Provide self-adhering neoprene gasketing at narrow faces of Mullion Mate. Where Mullion Mate abuts glass surfaces, notch closure around horizontal storefront system members for close fit to glass.

## 2.5 GLASS AND GLAZING MATERIALS

### A. Glass and Glazing Materials:

1. Storefront System and Doors: Type as indicated on Drawings, and as specified in Section 08 81 00.

### B. Glazing gaskets and seals used for aluminum work shall be an integrated glazing system designed by the aluminum work manufacturer to produce a watertight assembly and shall be physically and chemically compatible with each other and with adjacent materials.

1. Neoprene and EPDM materials shall not come in contact with silicone sealant materials.
2. Gaskets shall be designed, when in final compression form, to be compressed a minimum of 25 percent and a maximum of 40 percent, and to exert a pressure of between 4 pounds and 10 pounds pressure per linear inch.
3. All side light and transom glass shall be set with the same type and size of glazing gasket material.

### C. Contractor shall provide and set silicone setting blocks for all window systems installed. Each glass panel supplied shall display a factory mark certifying each glass panel is manufactured of tempered glass.

1. All setting blocks shall be silicone, of 80 – 90 durometer, and be set at 1/4 points of glass.

## 2.6 SEALANT MATERIALS

### A. Sealant and Backing Materials: As specified in Section 07 92 00.

## 2.7 FABRICATION

- A. Fabricate components with minimum clearances and shim spacing around perimeter of assembly yet enabling installation and dynamic movement of perimeter seal.
- B. Accurately fit and secure joints and corners. Make joints flush and hairline. Sealant will not be allowed at exposed joints.
- C. Prepare components to receive anchor devices. Fabricate anchors.
- D. Arrange fasteners and attachments to conceal from view.
- E. Prepare components with internal reinforcement of 1/4 inch thick galvanized steel mounting backing plates for door hardware and hinge hardware as per ASTM A36.
- F. Exposed work shall be carefully matched to produce continuity of line, design, and finish. Joints in exposed work, unless otherwise shown or required for thermal movement, shall be accurately fitted, rigidly secured, with hairline contacts.
- G. Removable members such as glass stops shall be extruded and securely engaged into adjacent components as indicated by product manufacturer.
- H. Face clearances between glass and stop shall comply with code requirements and glass manufacturer's recommendations.

- I. All fasteners shall be of sufficient strength to support vertical dead load, with a Factor of Safety of 1.5. They shall be spaced and be sized to develop the maximum strength of the members they secure or support. Washers, where required, shall be of the same material as the fastener. Unless otherwise shown or approved, fastening systems shall be concealed.
- J. Install internal steel stiffeners within the storefront system as required to meet the deflection requirements at the location of this project.
- K. Sealants, gaskets, setting blacks, tapes, and separators, where used, shall be physically and chemically compatible with each other and with adjacent materials. Items shall be installed so that they will not become dislodged during or after assembly of units.

## 2.8 SPECIAL REQUIREMENTS

- A. Dissimilar Materials Protection: Use chromate gasketing or heavy coat of alkali resistant bituminous paint to separate aluminum surfaces in contact with other metals or concrete. Aluminum need not be separated from stainless steel or galvanized steel.

## 2.9 FINISH

- A. All aluminum extrusions shall have Architectural Class II finish per Aluminum Association Standard AA-M10C21A31, clear anodized finish complying with AAMA 611, 0.4 mil minimum thickness. Anodized finish shall match existing adjacent storefront as closely as possible based on Architect's acceptance of samples provided.

# PART 3 EXECUTION

## 3.1 EXAMINATION

- A. Verify dimensions, tolerances, and method of attachment with other work.
- B. Verify wall openings and adjoining air and vapor seal materials are ready to receive work of this Section.

## 3.2 INSTALLATION

- A. Install window wall system and doors in accordance with accepted shop drawings, manufacturer's written installation instructions, and AAMA SFM-1. Manufacturer shall provide written installation instructions and installer shall comply with these written installation instructions.
- B. Align assembly plumb and level, free of warp, or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- C. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- D. Provide alignment attachments and shims to permanently fasten system to building structure.

- E. Frames shall be anchored to structure with concealed fasteners appropriate for use with type of adjacent construction. Fasteners shall securely fasten frames to wall construction involved. Fasteners shall provide stiffness and rigidity to keep frames square, in accurate position without twisting, buckling, or warping. Fasteners to framing substrate shall be the following minimums: greater as required by the storefront manufacturer or as conditions warrant:
  - 1. Metal Framing: #14 stainless steel self-tapping sheet metal screws at 12 inches on center all around by length as required to penetrate framing member 1/4 inch minimum.
- F. Install perimeter metal flashings.
- G. Install perimeter sealant to method required to achieve performance criteria and installation criteria described in Section 07 92 00.
- H. Set thresholds in bed of mastic and secure with mechanical fasteners, minimum 3 per threshold.
- I. Refer to Section 08 71 00 for door hardware installation requirements.
- J. Install glass in accordance with Section 08 81 00, to glazing method required to achieve performance criteria.

### 3.3 TOLERANCES

- A. Maximum Variation from Plumb: 0.06 inch every 3 feet non-cumulative or 0.06 inch per 10 feet, whichever is less.
- B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

### 3.4 CLEARANCES

- A. Top and sides of door shall have a minimum of 1/16 inch to a maximum of 1/8 inch clearance.
- B. Bottom of door and threshold shall have a minimum of 1/8 inch to a maximum of 1/4 inch clearance.
- C. All door frames shall be measured with the minimum clearance of exact size or a maximum of 1/4 inch overall clearance to fit sides of opening to 1/8 inch at top of opening.
- D. All installation clearances for door frame and door shall be strictly adhered to. No other minimum or maximum clearances will be acceptable and will prove cause for total replacement of the opening at the sole expense to Contractor.
- E. Mortise hardware shall fit flush with finished trim moldings and applied directly to recessed sidewalls of the door and or frame system. Cutouts in door or frame moldings shall require separate screw applied tabs or straps on which to mount concealed hardware per manufacturer's templates as detailed on Drawings. Where shims and spaces are required for finished appearance, they shall provide full and solid bearing for the hardware.

### 3.5 ADJUSTING

- A. Adjust work under provisions of Division 01.
- B. Adjust operating hardware for smooth operation.

3.6 CLEANING

- A. Clean work under provisions of Division 01.
- B. Remove protective material from pre-finished aluminum surfaces.
- C. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.
- D. Remove excess sealant by method acceptable to sealant manufacturer.

3.7 PROTECTION OF FINISHED WORK

- A. Protect finished Work under provisions of Division 01.
- B. Protect finished Work from damage.

END OF SECTION



SECTION 08 71 00  
DOOR HARDWARE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. BHMA finish door hardware for aluminum and wood doors.
- B. Accessories including but not limited to locking devices, closers, door stops, kickplates, seals, and thresholds.

1.2 PRODUCTS SUPPLIED BUT NOT INSTALLED UNDER THIS SECTION

- A. Hardware templates for doors and frames.

1.3 RELATED SECTIONS

- A. Summary of Work: Division 01, applicable Sections.
- B. Section 07 92 00 – Joint Sealants.
- C. Section 08 11 13 – Hollow Metal Doors and Frames.
- D. Section 08 14 00 – Wood Doors.
- E. Section 08 41 13 – Aluminum Framed Entrances and Storefronts.
- F. Section 09 91 00 – Painting.

1.4 REFERENCES

- A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only.
  - 1. Refer to Division 01 for definitions, acronyms, and abbreviations.
  - 2. Unless otherwise noted; standards, manuals, and codes refer to the latest edition as of the issue date of this Project Manual.
- B. Conform to the following Referenced Standards and Requirements:
  - 1. CBC – 2025 California Building Code.
  - 2. ADA – Americans with Disabilities Act - 2010 Standards for Accessible Design.
  - 3. NFPA 101 – Life Safety Code.
  - 4. ANSI A156 Series – Builders Hardware Manufacturers Association (BHMA) Standards Set.
- C. Conform to the following Regulatory Requirements (CBC – 2025 California Building Code):
  - 1. Doors / Doorways as part of an accessible route shall comply with CBC Section 11B-404.
  - 2. All hardware for accessible doors shall meet the requirements of CBC Sections 11B-404.2.7, 11B-404.2.9, and 1010.1.9.1.
  - 3. The clear opening width for a door shall be 32 inches minimum. The swinging doors it

- shall be measured between the face of the door and the frame stop, with the door open 90 degrees.
- a. There shall be no projections into it below 34 inches above finish floor and 4 inch maximum projections into it between 34 inches and 80 inches above finish floor or ground.
  - b. Door closers and stops shall be permitted to be 78 inches minimum above finish floor or ground per CBC Section 11B-404.2.3.2.
4. Hand-activated door opening hardware, handles, pulls, latches, locks, and other operating devices on accessible doors:
- a. Shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist.
  - b. Lever hardware shall be so mounted / centered between 36 inches and 44 inches above finished floor or ground.
  - c. Panic hardware shall be so mounted / centered between 36 inches and 44 inches above finished floor or ground. The clear width of the exit way is not less than 32 inches measured between the face of the door and the opposite stop per CBC Section 11B-404.2.3.
  - d. Hardware for door handles, pulls, latches, locks, and other operating devices for use on means of egress doors shall comply with SFM Standard 12-10-2, Section 12-10-202 as contained in CCR Title 24, Part 12.
5. The force for pushing or pulling a door open shall be as follows per CBC Section 11B-404.2.9:
- a. Interior hinged doors, sliding or folding doors and exterior hinged doors operating force required to push or pull open a door shall not exceed 5 pounds.
    - 1) These forces do not apply with to the force required to retract latch bolts or disengage other devices that hold the door in a closed position.
  - b. The force required to activate any operable parts, such as retracting latch bolts or disengaging other devices, shall be no greater than 5 pounds to comply with CBC Section 11B-309.4.
  - c. Forces shall be applied to the latch side of the door per CBC Section 1010.1.3.1.
6. Door closing speeds shall be as follows per CBC Section 11B-404.2.8:
- a. Mount door closers for maximum swing of door before setting stops.
  - b. Doors closers, when provided, shall have sweep period adjusted: minimum of 5 seconds for a door to close from the 90 degree position to the 12 degree position.
7. Thresholds shall comply with CBC 2025.
8. Floor stops shall not be located in the path of travel and 4 inches maximum from walls.
9. Hardware, including panic hardware, shall not be provided with "Night Latch" (NL) function for any accessible doors unless the following conditions are met. Such conditions must be clearly demonstrated and indicated in the specifications for devices:
- a. Such hardware has a "dogging" feature.
  - b. It is dogged during the time the facility is open.
  - c. Such "dogging" operation is performed only by employees as their job function (non-public use).

10. Pair of doors: limit swing of one leaf to 90 degrees so that a clear floor space is provided beyond the arc of the swing for the wall-mounted tactile sign per CBC Section 11B-703.4.2.

## 1.5 QUALITY ASSURANCE

### A. Supplier Qualifications and Documentation:

1. Hardware Supplier Qualifications: Firm specializing in the supply and servicing of institutional and commercial door hardware; accredited by manufacturers; and having a minimum of three years documented experience. Hardware supplier to furnish list of at least ten past, finished projects. Include date completed, project location, and references.

### B. Manufacturer of Submitted Devices - Qualifications and Documentation:

1. Manufacturer Qualifications: Manufacturer specializing in manufacturing institutional and commercial door hardware with a minimum five years with the following documented experience. Furnish list of at least ten past, finished projects. Include date completed, project location, and references. Past project contact information will determine if Builders Hardware is acceptable.

### C. Installer of Submitted Devices - Qualifications and Documentation:

1. Installer of assembly shall be trained in the trade of hanging commercial doors on commercial frames with commercial hardware. Supplier and Installer of door assemblies shall be authorized representative of manufacturers and have minimum of five years successful experience in detailing, supplying, and installing door assemblies specified on projects of similar size, complexity, and type to this Project. Provide written documentation to show closers will be installed by an individual with successful experience installing closers to meet 5-pound opening force for non-rated door complexity.

## 1.6 SUBMITTALS

- A. The hardware groups/sets specified in Section 08 71 00 - Part 3 are intended to establish type and design standard when used together with the requirements of this Section, Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections. Examine Contract Documents and furnish proper hardware for door openings. Refer to specifications for clarification and detailed requirements and provide products and services in specifications even if not written in hardware groups/sets in Section 08 71 00 - Part 3.
- B. For each opening submit coordinated (means and methods) requirements in accordance with Division 01 and a detailed door, frame, and hardware schedule. See pre-hardware and hardware scheduling requirements below. Submittals that do not meet means and methods, including missing related doors/frames submittal/shop drawings, will be returned for correction before checking.
- C. Pre-Hardware Scheduling Tasks:
  1. Coordinate work of this Section with other directly affected Sections and scope.
  2. Provide required Division 08, means and method type work in accordance with Contract Documents at no additional cost to project, including Division 01 and language below. This Section supplier shall be provided with full documents, not just Section 08 71 00 Part 3 hardware group/sets as that process does not meet Contract requirements.

3. Means and method type work includes, but is not limited to, coordination with plans and other specifications, templating, Section 08 71 00, and other Division 08 Section engineering and coordination. Starting submittal work or labor before means and method type work is completed does not constitute change orders.
4. Coordinate with door/frame internal reinforcement for door hardware. In particular, coordinate door preparation in accordance with applicable regulatory and trade standards specified.

D. Hardware Schedule:

1. Submit required vendor qualification letters and documentation (see above "QUALITY ASSURANCE").
2. Non-design team coordination and requirements:
  - a. Submittals for coordinated door/frame/hardware items, shall be submitted at the same time for review of total opening requirements. Do not submit Section 08 71 00 scope without coordinated door and frame packages and above RFI/clarification process tasks completed. Submittals that do not include related doors/frames will be returned for correction before checking.
  - b. Section submittals and/or shop drawings to be reviewed and have comments by non-design team (Contractor) before sending to design team. If submittals do not meet Contract requirements, return to hardware vendor for re-submittal. In many cases, unacceptable submittals are passed though without non-design team (Contractor) comments (coordinate per Contract).
3. Submit hard copies of hardware schedule (number of copies per Division 01) as well as submit editable, PDF files via electronic email of ftp site process in Vertical Format as illustrated by the Sequence of Format for the Hardware Schedule as published by the Door and Hardware Institute. Horizontal-type schedules will be returned for correction before reviewing.
  - a. Shop drawings / hardware schedule shall clearly indicate each hardware group specified and manufacturer of each item proposed as well as each door number that the hardware is assigned to.
  - b. Vertical schedule format sample:

| Heading Number 1 (Door Schedule or Architectural Assigned Hardware Group/Set number from part 3 = HW # __) |                    |                                                                                                                                |        |                   |
|------------------------------------------------------------------------------------------------------------|--------------------|--------------------------------------------------------------------------------------------------------------------------------|--------|-------------------|
| 1 Single Door #1 - Exterior from Corridor 101                                                              |                    | Opening Size                                                                                                                   | 90°    | RH                |
|                                                                                                            |                    |                                                                                                                                |        |                   |
| Quantity                                                                                                   | Device Description | Device # (include specification language)                                                                                      | Finish | Manu-<br>facturer |
| 4                                                                                                          | Hinges             | 4.5 x 4.5 NRP x fasteners                                                                                                      | 630    |                   |
| 1                                                                                                          | Lockset            |                                                                                                                                | 630    | SC                |
| 1                                                                                                          | I/C Cylinders      | Rim or Mortise x appropriate cam x blocking rings as required (rim or mortise type and quantity as required by locking device) | 626    | SC                |
| 1                                                                                                          | Permanent Core     |                                                                                                                                | 626    | SC                |

4. Illustrations from manufacturer's catalogs and product data:
  - a. Provide cut sheets and product data with vertical format hardware submittal (same timeframe) as well as door and frame information to be reviewed as one submittal package. Manufacturer's hard copy as well as PDF catalog cut sheets and product data shall not be submitted before editable, PDF files vertical format hardware submittal. See above Sequence of Format requirement. Catalog cut sheets and product data sent as submittals before the typed-out nomenclature of hardware part numbers (vertical format hardware submittal) will be returned without review.
5. Provide hardware schedule and hardware templates to door and frame manufacturer. Provide two templates to those manufacturers who are not currently registered template book holders.

E. Vendor meetings or coordination prior to purchasing materials:

1. Convene coordination meeting between all opening vendors and installers at least two weeks prior to purchasing doors, frames, door hardware, and electrical devices required for complete systems. Attendance includes but is not limited to hardware supplier and/or installer, door supplier and/or installer, frame supplier and/or installer, security card reader vendor and/or installer, and electrical. If hardware changes are required due to these meetings, communicate changes to design team before ordering materials.

F. Templates:

1. Provide listing of manufacturer's template numbers for each item of hardware in hardware schedule.
2. Submit templates and "Reviewed Hardware Schedule" to door and frame supplier and others as applicable to enable proper and accurate sizing and locations of cutouts and reinforcing.

G. Installation Instructions:

1. Provide manufacturer's written installation and adjustment instructions for finish hardware.
2. Send installation instructions to site with hardware.

H. Contract Closeout Submittals: Include specific requirements indicated below.

1. Operating and maintenance manuals: Submit three sets containing the following:
  - a. Complete information in care, maintenance, and adjustment, data on repair and replacement parts, and information on preservation of finishes.
  - b. Catalog pages for each product.
  - c. Name, address, and phone number of local representative for each manufacturer.
  - d. Parts list for each product.
  - e. Copy of final accepted hardware schedule, edited to reflect "As installed".
  - f. Copy of final keying schedule.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Division 01.
- B. Deliver products in manufacturer's original containers, dry and undamaged, with seals and intact.

- C. Storage: Store materials in a cool and dry location, elevated from the ground and protected from the elements, and secured from theft or pilferage.

## 1.8 WARRANTY

- A. Comply with provisions of Division 01.
- B. Warranty installed units shall be free from defects in material and workmanship as follows:
  - 1. Hinges: Lifetime Warranty (Life of Building).
  - 2. Locksets and Exit Devices: Three years.
  - 3. All other hardware: Two years.

## 1.9 MAINTENANCE

- A. Provide special wrenches and tools applicable to each special hardware component.
- B. Provide maintenance tools and accessories supplied by hardware manufacturer.

## PART 2 PRODUCTS

### 2.1 FINISHES

- A. Typical BHMA finish designation references:
  - 1. Typical BHMA finish designation references:
    - a. BHMA 626 – Satin chromium plated brass or bronze.
    - b. BHMA 628 – Satin or dull aluminum, clear anodized (uncoated).
    - c. BHMA 630 – Satin stainless steel.
  - 2. Closers:
    - a. BHMA 689 – Sprayed aluminum paint finish (back of house where specified).

### 2.2 HARDWARE TEMPLATE

- A. Make templates for hardware to be applied to metal doors or pre-finished doors.
- B. Hinge templates shall conform to ANSI A156.7.
- C. Promptly furnish template information or templates to door and frame manufacturers.
- D. Coordinate hardware items to prevent interference with each other.

### 2.3 SCREWS, BOLTS, AND FASTENING DEVICES

- A. All exposed fasteners to be stainless steel or zinc plated.
- B. Exposed head oval phillips type screws in countersunk holes unless otherwise specified. Use screws, bolts, washers, grommets, nuts, and other fastening devices of appropriate length, type, head, metal, and finish as necessary for proper match and application of hardware.
- C. Threshold anchors shall be Flat Sleeve Anchors cadmium plated expansion anchor screw in one unit.

## 2.4 SUBSTITUTIONS

- A. Products referenced by specific brand names and model numbers have been identified by Owner to match other products in use either completed or in the course of completion. No substitutions permitted per Public Contract Code Section 3400.

1. Otherwise refer to Division 01 for substitutions.

## 2.5 HANGING HARDWARE

- A. Butt Hinges:

1. Acceptable Manufacturers:

- a. McKinney Products Co.
- b. Ives Manufacturing by Allegion.
- c. Hager Manufacturing.

2. Where hardware groups/sets have different information (number of hinges and sizing), refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on Drawings and detailed requirements for each type of device.

- a. Butt hinges shall be manufactured in accordance with ANSI/BHMA A156.1.
- b. Provide "weight/strength" as specified in hardware groups/sets in Part 3 (hinge nomenclature basis-of-design weight/strength).
- c. For doors 1-3/4 inches thick and up to 36 inches wide, provide hinge height of 4-1/2 inches.
- d. For doors 1-3/4 inches thick and 37 inches to 48 inches wide, provide heavy duty, four ball bearing hinges and height of 5 inches.
- e. If hardware sets specify height (example: 5 inches tall at 36 inch wide door), provide height as specified for project standards at these locations.
- f. Provide two butts for doors up to 60 inches high and one additional butt for each 30 inches of height or fraction thereof.
- g. Provide non-removable pins at exterior doors.
- h. Provide ball-bearing hinges: Non-ball-bearing hinges are not acceptable.

## 2.6 SECURING DEVICES (LATCHING SYSTEMS)

- A. Provide all latching devices that are lockable including, but not limited to, door locks and panic/exit devices that comply with CBC Sections 1010.1.9 through 1010.1.11. All new construction projects shall include locks that allow the doors to be locked from the inside. This requirement applies to classrooms and any other school room with an occupancy of five or more persons, but does not include doors that are locked from the outside at all times or student restrooms.

- B. Cylindrical Locksets and Latchsets:

1. Acceptable Manufacturers:

- a. Schlage Lock Co. ND Series.
- b. Owner's standard, no substitutions permitted.

2. Levers:

- a. Provide levers to return to door within 1/2 inch (levers that have return to door within 1/2 inch to meet code).
- b. Lever Style: Traditional Square Style RHO.
  - 1) Provide exterior side lever trim with vandal resistant feature. Locked exterior lever freely rotates withstanding abuse and vandalism while remaining securely locked. Example: Schlage ND series Vandlgard™.
3. Where hardware groups/sets have different information, refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on Drawings and detailed requirements for each type of device:
  - a. Cylindrical locksets shall be a BHMA Certified Product, meeting requirements per ANSI A156.2, 1996.
  - b. Backsets: 2-3/4 inches.
  - c. Strikes:
    - 1) Provide ANSI 4-7/8 inch standard strike.
    - 2) Provide curved lip-type strike at all locations if possible to prevent catching clothing or other objects on strike. Where required, provide detail and flat strike.
    - 3) Where required, provide extended lip strike so that the lock or latchset latch will not come in contact with frame or added trim on or adjacent to the frame. Example: Don Jo device #MEST-104, but provide submitted manufacturer equivalent extended lip strike.

C. Flush Bolts and Dust Proof Strikes:

1. Acceptable Manufacturers:
  - a. Ives Manufacturing.
  - b. Triangle Brass Manufacturing Company, Inc. (Trimco).
  - c. Rockwood.
  - d. Hager Manufacturing.

2.7 KEY SYSTEMS (CYLINDERS, CORES, AND KEYS)

- A. Where hardware groups/sets have different information, refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on drawings and detailed requirements for each type of device. Keying specifications below override hardware set/group nomenclature.
- B. For all locking or dogging devices, provide complete cylinder system and coordination whether or not specified in Section 08 71 00, Part 3 hardware sets as required by locking device.
  1. Different locking devices require a set of different requirements including, but not limited to, appropriate cams for mortise-type cylinders, appropriate tail pieces and size for rim-type cylinders, blocking rings as required for locking and cylinder devices to not rattle and meet manufacturers' warranties, as well as cylinders that are to be coordinated with construction cores/cylinders and final pinned cores/cylinders shipped to Owner by Registered Mail per below to meet system requirements.
  2. Scope is means and method type work by a certified locksmith and/or DHI individual to engineer rim or mortise cylinders and blocking rings or tail-piece components as required for submitted locking devices. Since there could be as many as 500 options for

rim or mortise cylinders with the locking devices and different manufactures that may be submitted, this means/methods-type work is required, similar to templating doors and frames to accept hardware. Coordinate as required.

C. Key Systems (Cylinders, Cores, and Keys):

1. Manufacturers:
  - a. Schlage manufacturing.
  - b. Owner's standard, no substitutions permitted.
2. For all locking or dogging devices, provide complete keying system whether or not specified in Section 08 71 00, Part 3 hardware sets including lock cores, mortise cylinders, and rim cylinders keyed as directed by Owner in submittal process. Key System shall be:
  - a. Patented Schlage manufacturing Primus Level 3.
3. Keyway: Provide as instructed by Owner during submittal process.

D. Keying Requirements:

1. Provide keyed, construction cores and keys during the construction period.
  - a. Provide full sized cylinders or brass construction cores and brass keys at all interior and exterior doors. Plastic cores are not permitted.
  - b. Construction control and operating keys and core shall not be part of the Owner's permanent keying system or furnished in the same keyway or key section as the Owner's permanent keying system. Permanent cores and keys prepared according to the accepted keying schedule shall be furnished to the Owner.
2. Keying Meeting and Programming Schedule:
  - a. Do not provide keying matrix in original hardware submittals. After hardware has been submitted and reviewed in accordance with Division 01 and Section 08 71 00 requirements, arrange a keying matrix/programming meeting with Owner Representative and various hardware suppliers/vendors representing both the cylinders/keying system and different, reviewed submittals (design team not required).
    - 1) Copies of the reviewed door and frame submittals shall be brought to the meeting with card reader and keyed doors highlighted for review.
    - 2) Follow procedures for keying meeting and programming schedule as outlined by the Door Hardware Institute. DHI procedures are based on Door Hardware Institute core class entitled Masterkeying class #AHC200.
  - b. Keying meeting to produce a programming schedule/matrix based on the following:
    - 1) Furnish keys in the following quantities (total quantity of keys part of bid package):
      - a) 5 each Grand master-keys per set.
      - b) 6 each Masterkeys per set.
      - c) 3 each Change keys each lock, core or cylinder.
      - d) 5 each Permanent Extractor keys.
      - e) 9 each Construction masterkeys.
      - f) 2 each Construction Core Extractor keys.
    - 2) Provide keying system expansion parameters.

- a) Plan twenty changes directly under the grand.
- b) Plan ten master keys.
- c) Plan fifty changes each for each master.
- 3) Permanent keys and cores shall be stamped with the applicable key mark for identification. The visual key control marks or codes shall not include the actual key cuts.
- 4) Permanent keys shall be stamped "Do Not Duplicate".
- c. Furnish typed programming meeting matrix and notes in PDF, editable electronic format as well as mailed, hard copy to Owner Representative for final review.
- d. Furnish keying and programming schedule to key/core/cylinder manufacturing factory for production of key/core/cylinder devices.
- e. Transmit pinned cores/cylinders as well as cut grand masterkeys, masterkeys, change keys and other security keys to Owner Representative by Registered Mail, return receipt requested. All permanent cores and keys shall be sent directly from the factory to the Owner Representative for ID and verification.
  - 1) Accompany Owner Representative to install permanent cylinders and/or cores in permanent locking or keying housings (responsible to prepare locking systems, installation ready for final cylinders and/or cores, free from dirt, debris or overtightening of locking devices that may cause binding of keyed devices).
  - 2) Provide instructions for adjustments and maintenance of hardware and hardware finishes.

## 2.8 CLOSING DEVICES

### A. Surface Mounted Closers:

#### 1. Rack and Pinion Manufacturers:

- a. LCN Manufacturing: 4040XP as scheduled.
- b. Owner's standard, no substitutions permitted.

### B. Where hardware groups/sets have different information, refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on Drawings and detailed requirements for each type of device:

- 1. ANSI A156.4, Grade 1; UL Listed; meets UL 10C and SFM Standard 12-7-4 for positive pressure fire test. Whether or not specified in hardware groups/sets, submit 4040XP or approved equal closer at all openings that are smoke-rated or fire-rated even if closer is omitted from groups/sets.
- 2. Closers shall have multi-size spring power adjustment to permit setting of spring from 1 through 6 with additional spring power available. Provide ADA compliant setting nomenclature during submittals as recommended by closer manufacturer.
- 3. Installation Plates, Brackets, and Miscellaneous Adapters:
  - a. Furnished and installed all door closers with thru bolts.
  - b. Provide drop plates, brackets, or adapters for arms as required to suit details and install as directed by manufacturer's templates. Furnish and install drop plates at reverse bevel doors and at doors with 170 degrees to 180 degrees swing.

## 2.9 STOPS

### A. Floor or Wall Stops:

#### 1. Acceptable Manufacturers:

- a. Ives Manufacturing.
- b. Triangle Brass Manufacturing Company, Inc. (Trimco).
- c. Rockwood.
- d. Hager Manufacturing.

#### 2. Where hardware groups/sets have different information, refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on Drawings and detailed requirements for each type of device:

- a. Stops, Bumpers and/or Holders shall meet the requirements of BHMA A156.16, Grade 1.
- b. Coordinate with specifications in Section 09 22 16 for required wall backing.

## 2.10 ACCESSORIES

### A. Kick/Mop Plates:

#### 1. Acceptable Manufacturers:

- a. Ives Manufacturing.
- b. Triangle Brass Manufacturing Company, Inc. (Trimco).
- c. Hager Manufacturing.

### B. Where hardware groups/sets have different information, refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on Drawings and detailed requirements for each type of device

1. Coordinate length and sizes for hardware devices before ordering materials. Verify the door hardware is compatible for use with the doors and door/frames. Protection plate example: LDW nomenclature in Part 3 means "less door width". A 48 inch wide door would have a 46 inch wide protection plate. Width shall be one inch less than door width unless doors have protective edge guards or center mullions. Coordinate before submittals.

### C. Push/Pull Plates:

1. Provide pulls at specified doors/openings. Where Trimco pulls are specified, provide request for substitution for matching pulls and/or pull manufactures.NO coatings.

### D. Sound Seals:

#### 1. Acceptable Manufacturers:

- a. National Guard Products (NGP).
- b. Pemko Manufacturing, Inc.
- c. Zero International.

#### 2. Where hardware groups/sets have different information, refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on Drawings and detailed requirements for each type of device:

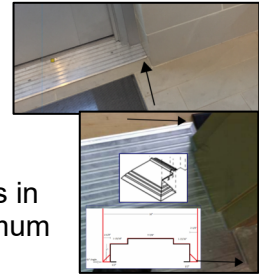
E. Astragals, Door Bottoms, and Thresholds:

1. Acceptable Manufacturers:

- a. Pemko Manufacturing, Inc.
- b. National Guard Products (NGP).
- c. Zero International.

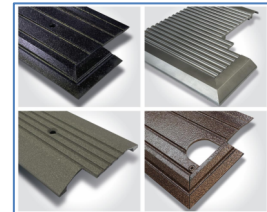
2. Whether or not specified below in hardware sets, thresholds shall be detailed as part of engineering/shop drawings/means and methods before submittals.

- a. Thresholds shall comply with CBC 2025 Section 11B-404.2.5 (shall not exceed 1/2 inch in height) and shall comply with Sections 11B-303 (beveled requirements stating changes in level between 1/4 inch high minimum and 1/2 inch high maximum shall be beveled with a slope not steeper than 1:2.).

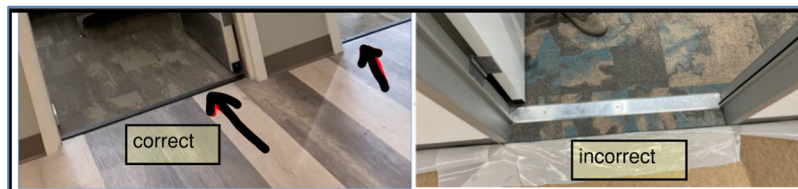


- b. Thresholds that extend past door frame shall wrap frame stops. Cut around stops, then continue into rabbits, face of frame and wall conditions if wall conditions are in same application (see example of where threshold meet adjacent walls in snippet below):

- c. Whether or not specified below, where thresholds are longer/wider than 6" thresholds to have beveled miter ends. 45-degree miter cut and a closed end, welded with returns to door/frame. Example: NGP manufacturing nomenclature RCE throughout (see example snippet).



- d. Whether or not marked throughout, verify the poured sill condition and/or interior sill or flooring transitions before ordering devices, materials or doors (door undercut will be affected by flooring transitions, see Part 3 below for undercut requirements):
  - 1) Typical exterior conditions: Often in projects, Contractor pours or installs a sill condition that is different from the design team sill detail. Per specification provide coordinated threshold as required by current sill condition (coordination between sub/Vendor and Contractor in field). Contractor to coordinate.
  - 2) Typical interior conditions: Whether or not marked throughout, verify the sill condition. Often in projects, Contractor does not prep the floor to have the transition between flooring materials in the correct place (where interior thresholds occur sill conditions to be coordinated so auto door bottom or bottom of doors should sit directly above thresholds and the finishes of floors are to be aligned under to door - coordination between sub/Vendor and Contractor in field - see example picture below of correct versus non-correct flooring transitions - coordinate as required, means and methods):



## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Examine doors and frames and verify mounting locations as indicated on shop drawings.
- B. Report unacceptable conditions to the Architect. Begin installation only when unacceptable conditions have been corrected.

### 3.2 INSTALLATION

- A. Install in accordance with manufacturer's printed instructions and accepted shop drawings.
- B. Door-Floor Clearances:
  - 1. Unless otherwise shown, provide the following door-floor clearances:
    - a. Maximum 3/8 inch.
  - 2. Undercut doors so that the sweeps still fit tight against the sill or threshold condition, but as the door opens and sweeps away from sill or threshold, the door bottoms do not rub on the floor. Metal installation parts of door bottoms are typically part of the door assembly and only the gap between the metal part and sill/threshold are seen as the undercut. Means and methods: coordinate as required for door and hardware with finish floors, toppings, thresholds, and performance ratings.
- C. Hardware Placement:
  - 1. Unless otherwise shown or required by CBC 2025, ADA Act - 2010 Standards for Accessible Design and/or Title 24, place hardware at the following heights:
    - a. Hinges: Door and frame manufacturer's standard scope per additional specifications and plans.
    - b. Lever handles for latchsets, lockset, and panic/exit device pull, lever trim:
      - 1) 38 inches above finish floor/surface.
      - 2) Verify manufacturer's template with door design.
    - c. Panic devices push bar:
      - 1) Panic hardware shall be so mounted / centered between 36 inches and 44 inches above finished floor or ground.
      - 2) Verify manufacturer's template with door design to meet CBC 2025 exterior, pull side trim.
    - d. Door Pulls and Push Bars (centerline): mounted / centered 42 inches above finished floor or ground.
    - e. Door Push Plates (centerline): mounted / centered 42 inches above finished floor or ground.
    - f. Closers:
      - 1) To meet opening force requirements
      - 2) See installation below.
  - 2. Hardware for door handles, pulls, latches, locks, and other operating devices for use on means of egress doors shall comply with SFM Standard 12-10-2, Section 12-10-202 as contained in CCR Title 24, Part 12.

D. Installation:

1. Except for hinges, do not install hardware until painting and finishing work is completed.
2. Drill and tap for surface mounted hardware on metal.
3. Hinges: Set hinges snug and flat in mortises. Hand turn screws to flat seat – do not drive.
4. Locksets: Install locks with keyways in proper position. Install levers, roses, and escutcheons firmly affixed.
5. Closers:
  - a. To open and latch smoke or fire rated doors correctly (positive latch at all times for rated doors when door is not in use), install closer units per factory templates to meet manufacturer requirements.
  - b. To meet non-rated opening/exterior opening force requirements as well as close and latch non-smoke non-fire rated doors:
    - 1) Closers are to be installed as close to the hinge side of door as possible by a trained installer per this Section, Part 1 “Quality Assurance, Installer Qualifications”, installer an authorized representative of manufacturers, minimum of five years successful experience installing closers to meet 5-pound opening force for non-rated door complexity”.
    - 2) For non-smoke or non-fire rated doors, before installation of closers install one mockup door for each kind of closer application. Example: parallel, regular arm, stop arm and/or top-jamb arm application if specified. Confirm doors meet 5-pound opening force and still close door. This will ensure proper installation for doors to open at 5 pounds opening force before remaining non-rated opening closers are installed. The closer the closer is installed to the hinge, the better performance for 5 pound opening force, but still close and latch door.
  - c. Mount door closers for maximum swing but at non-rated doors to meet 5-pound opening force. At all possible openings, mount door closers for maximum swing of door before setting stops.
  - d. Mount door closers for maximum swing, but at non-rated doors to meet 5-pound opening force. Drawings may show doors open to only 90 degrees (Revit or CAD system set up), but unless noted or specified with limiter (stop arm devices below), all doors to open for maximum swing against adjacent 180 wall if nothing inhibits door from doing so. Include wide-throw hinges per specs and installation for 170 degree to 180 degree or maximum swing of door before installing stops.
6. Floor Stops: See notes on closers and hinges above. After auto operator or closer devices are installed, and door is opened as far as possible without #1) occupant excessive force on auto operator or closer; and #2) door does not hit adjacent wall or other surfaces, stops shall be installed at substantial completion a maximum of 4 inches from adjacent walls and as far away from the hinge point as possible (preference is to have stops installed just below lever or pull locations).
7. Auto Door Bottom to not be adjusted until substantial completion. Door bottoms shall be raised to highest position while construction occurs so to not have rubber seal torn or damaged by debris under the door. At substantial completion, adjust door bottom to fully engage and touch the floor for proper sound dampening.
8. Silencers: Set in place before adjusting strikes.
9. Thresholds and Raindrips: Set in waterproof sealant and fasten anchors in pre-drilled

countersunk holes 18 inch on center maximum spacing and within 3 inches of each end.  
Minimum three anchors per threshold.

- a. manufacturer's printed instructions.

### 3.3 PAINT OR FIELD FINISHES

- A. Coordinate with Contact Documents including, but not limited to, Section 09 91 00 for paint and primer requirements.

### 3.4 ADJUSTING

- A. Adjust parts for smooth, uniform operation.
- B. Lubricate moving parts with manufacturer recommended lubricant.
- C. Replace units that cannot be adjusted and lubricated to operate freely and smoothly as intended for the application.
- D. Adjust door closer devices:
  - 1. Adjust closer operating.
    - a. Interior and Exterior Doors: not to exceed 5.0 pounds force.
  - 2. Adjust closer delay and operating speeds to comply with requirements of 2025 CBC Section 11B-404.2.8.1 and ADA – Americans with Disabilities Act - 2010 Standards for Accessible Design.
    - a. Doors closers, when provided, shall have sweep period adjusted: minimum of 5 seconds for a door to close from the 90 degree position to the 12 degree position.
    - b. Doors with spring hinges require a minimum of 1.5 seconds to close from the 70 degree to the closed position.

### 3.5 CLEANING

- A. Clean as recommended by manufacturer. Do not use materials or methods which may damage finish or surrounding construction.

### 3.6 HARDWARE SCHEDULE

- A. Manufacturers Legend:

| <u>Code</u> | <u>Name</u>              |
|-------------|--------------------------|
| IV          | Ives Manufacturing       |
| SC          | Schlage Manufacturing    |
| VO          | Von Duprin Manufacturing |
| LC          | LCN Closers              |
| PE          | Pemko Manufacturing      |
| TR          | Trimco Manufacturing     |
| RX          | Rixson Manufacturing     |

A. Hardware Columns - Example (Legend):

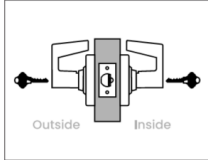
| Qty | Device Description | Device # (include specification language) | Finish | Manu |
|-----|--------------------|-------------------------------------------|--------|------|
| 1   | -----              | -----                                     | --     | --   |

- B. The following hardware sets are intended to establish type and standard of quality when used together with the requirements of this Section. See above Section and related Sections including Division 01. Examine Contract Documents and furnish proper hardware for door openings. Refer to Door Schedule on the Drawings for Hardware Group/Set assignments for each opening

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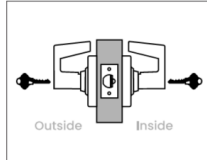
**Interior Hardware Sets (Typically Three-Digit Set Numbers):**

**Hardware Group/Set #101**

|                                                                                                                                                                                                                                                                                               |     |                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |            |    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|----|
|                                                                                                                                                                                                                                                                                               | Ea. | Hinge                                     | 5BB1HW (size and quantity per Section 08 71 00)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 630        | IV |
| 1                                                                                                                                                                                                                                                                                             | Ea. | Inactive LHR Leaf: Auto Flush Bolt        | #3810 x #3810 if metal or #3815L x #3815L if wood x dust proof strike #3911                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 626<br>630 | TR |
| 1                                                                                                                                                                                                                                                                                             | Ea. | Inactive LHR Leaf: Auxiliary Roller Catch | 1559A (install roller latch 4" to 6" away from auto flush bolt to stabilize door when active door is open)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 626        | TR |
| 1                                                                                                                                                                                                                                                                                             | Ea. | Classroom Security-Type Lockset           | <div>  <p>98 lockdown</p> </div> <div> <p><b>Schlage</b><br/><b>ND98</b></p>  <p><b>ANSI</b><br/><b>F110</b></p> <p><b>Vandigard® classroom security lock (180-degree lockdown)</b></p>  <ul style="list-style-type: none"> <li>• Lever with key cylinder both sides; deadlatch</li> <li>• In unlocked state latch is retracted by either lever</li> <li>• Outside lever is made inoperative by rotating key in either lever 180 degrees counter-clockwise and returning to start position; Vandigard® allows outside lever to rotate freely when locked</li> <li>• Unlock outside lever by rotating key 180 degrees clockwise in either lever and returning to start position</li> <li>• Inside lever always free for immediate egress</li> </ul> </div> | 626        | SC |
| 2                                                                                                                                                                                                                                                                                             | Ea. | Permanent Core                            | 20-740                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 626        | SC |
| 1                                                                                                                                                                                                                                                                                             | Ea. | Surface Closer                            | 4040XP parallel (installed push-side x 180-degree)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 689        | LC |
| 2                                                                                                                                                                                                                                                                                             | Ea. | Floor Stop                                | 1214 (installed per 08 71 00.Part 3)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 626        | TR |
| 1                                                                                                                                                                                                                                                                                             | Ea. | Seal                                      | Seals are by door/frame manufacturer (head, jambs)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |            |    |
| <p>Note 2: Furnish and install all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices required in specifications language above, architectural plans and full specification documents).</p> |     |                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |            |    |

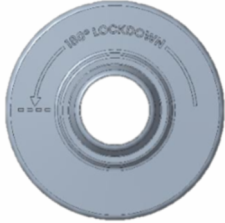
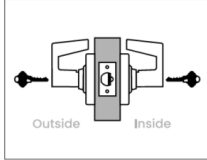
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**Hardware Group/Set #102**

|                                                                                                                                                                                                                                                                                        |     |                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |     |    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----|
|                                                                                                                                                                                                                                                                                        | Ea. | Hinge                                                                                                                               | 5BB1HW (size and quantity per Section 08 71 00)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 630 | IV |
| 1                                                                                                                                                                                                                                                                                      | Ea. | Classroom Security-Type Lockset<br><br>98 lockdown | ND98JD RHO x 180-degree turn lockdown signage (see snippet to the left) x 10-025<br><div><div><p>Outside      Inside</p></div><div><p><b>Schlage</b><br/><b>ND98</b></p></div><div><p><b>Vandlgard® classroom security lock (180-degree lockdown)</b></p></div><ul style="list-style-type: none"><li>• Lever with key cylinder both sides; deadlatch</li><li>• In unlocked state latch is retracted by either lever</li><li>• Outside lever is made inoperative by rotating key in either lever 180 degrees counter-clockwise and returning to start position; Vandlgard® allows outside lever to rotate freely when locked</li><li>• Unlock outside lever by rotating key 180 degrees clockwise in either lever and returning to start position</li><li>• Inside lever always free for immediate egress</li></ul></div> | 626 | SC |
| 2                                                                                                                                                                                                                                                                                      | Ea. | Permanent Core                                                                                                                      | 20-740                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 626 | SC |
| 1                                                                                                                                                                                                                                                                                      | Ea. | Closer x Stop Arm                                                                                                                   | 4040XP CUSH                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 689 | LC |
| 1                                                                                                                                                                                                                                                                                      | Ea. | Seal                                                                                                                                | Seals are by door/frame manufacturer (head, jambs)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |     |    |
| Note 2: Furnish and install all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices required in specifications language above, architectural plans and full specification documents). |     |                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |     |    |

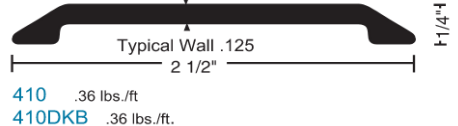
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**Hardware Group/Set #103**

|                                                                                                                                                                                                                                                                                        |     |                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----|
|                                                                                                                                                                                                                                                                                        | Ea. | Hinge                                                                                                                               | 5BB1HW (size and quantity per Section 08 71 00)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 630 | IV |
| 1                                                                                                                                                                                                                                                                                      | Ea. | Classroom Security-Type Lockset<br><br>98 lockdown | ND98JD RHO x 180-degree turn lockdown signage (see snippet to the left) x 10-025<br><br><br><b>Schlage ND98</b><br><br><br><b>Vandlgard® classroom security lock (180-degree lockdown)</b><br><br><b>ANSI F110</b><br><br><ul style="list-style-type: none"><li>• Lever with key cylinder both sides; deadlatch</li><li>• In unlocked state latch is retracted by either lever</li><li>• Outside lever is made inoperative by rotating key in either lever 180 degrees counter-clockwise and returning to start position; Vandlgard® allows outside lever to rotate freely when locked</li><li>• Unlock outside lever by rotating key 180 degrees clockwise in either lever and returning to start position</li><li>• Inside lever always free for immediate egress</li></ul> | 626 | SC |
| 2                                                                                                                                                                                                                                                                                      | Ea. | Permanent Core                                                                                                                      | 20-740                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 626 | SC |
| 1                                                                                                                                                                                                                                                                                      | Ea. | Closer x Stop Arm                                                                                                                   | 4040XP CUSH                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 689 | LC |
| 1                                                                                                                                                                                                                                                                                      | Ea. | Kick Plate                                                                                                                          | 8400 10" tall x 3" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 630 | IV |
| 1                                                                                                                                                                                                                                                                                      | Ea. | Floor Stop                                                                                                                          | 1214 (installed per 08 71 00.Part 3)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 626 | TR |
| 1                                                                                                                                                                                                                                                                                      | Ea. | Seal                                                                                                                                | S88D seals (head and jambs) by Pemko or approved seal manufacturer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |     |    |
| Note 2: Furnish and install all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices required in specifications language above, architectural plans and full specification documents). |     |                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |    |

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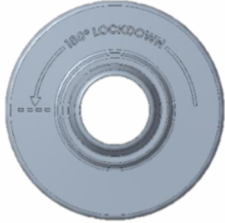
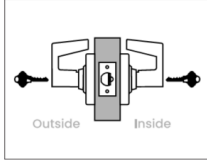
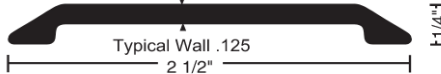
**Hardware Group/Set #104**

|   |     |                             |                                                                                                                                                                                                                                                                                                                                                            |           |    |
|---|-----|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----|
|   | Ea. | Hinge                       | 5BB1HW (size and quantity per Section 08 71 00)                                                                                                                                                                                                                                                                                                            | 630       | IV |
| 2 | Ea. | Back-to-Back Offset Pulls   | AP423-L-60" overall (pulls installed at least 12" AFF) x BHMA 710CU (Healthy Hardware Antimicrobial) finish. Do not block emergency key override                                                                                                                                                                                                           | 710<br>CU | TR |
| 1 | Ea. | Roller Latch                | 1559B (installed at top of door into frame header)                                                                                                                                                                                                                                                                                                         | 626       | TR |
| 1 | Ea. | Permanent Core              | 20-740                                                                                                                                                                                                                                                                                                                                                     | 626       | SC |
| 1 | Ea. | Wall Stop                   | 1270CV                                                                                                                                                                                                                                                                                                                                                     | 626       | TR |
| 1 | Ea. | Seal                        | Seals are by door/frame manufacturer (head, jambs)                                                                                                                                                                                                                                                                                                         |           |    |
| 1 | Ea. | Auto Door Bottom            | 423N for wood material doors (or submit 320N for metal doors) application as required per door material x DKB end caps by NGP or approved seal manufacturer                                                                                                                                                                                                |           |    |
| 1 | Ea. | Threshold (sound dampening) | <p>410DB (flat) by NGP or approved seal manufacturer (per specifications, provide full bed of mastic under all thresholds). Verify floor transition before ordering materials, final to be selected in submittals.</p>  <p>410 .36 lbs./ft.<br/>410DKB .36 lbs./ft.</p> |           |    |

Note 2: Furnish and install all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices required in specifications language above, architectural plans and full specification documents).

Blank space below and after a Group/Set is intentional to avoid, if possible, splitting a Hardware Group/Set onto two pages

**Hardware Group/Set #105**

|                                                                                                                                                                                                                                                                                        |     |                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |     |    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----|
|                                                                                                                                                                                                                                                                                        | Ea. | Hinge                                                                                                                               | 5BB1HW (size and quantity per Section 08 71 00)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 630 | IV |
| 1                                                                                                                                                                                                                                                                                      | Ea. | Classroom Security-Type Lockset<br><br>98 lockdown | ND98JD RHO x 180-degree turn lockdown signage (see snippet to the left) x 10-025<br><br><br><b>Schlage ND98</b><br><br><br><b>Vandlgard® classroom security lock (180-degree lockdown)</b><br><br><b>ANSI F110</b><br><br><ul style="list-style-type: none"> <li>• Lever with key cylinder both sides; deadlatch</li> <li>• In unlocked state latch is retracted by either lever</li> <li>• Outside lever is made inoperative by rotating key in either lever 180 degrees counter-clockwise and returning to start position; Vandlgard® allows outside lever to rotate freely when locked</li> <li>• Unlock outside lever by rotating key 180 degrees clockwise in either lever and returning to start position</li> <li>• Inside lever always free for immediate egress</li> </ul> | 626 | SC |
| 2                                                                                                                                                                                                                                                                                      | Ea. | Permanent Core                                                                                                                      | 20-740                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 626 | SC |
| 1                                                                                                                                                                                                                                                                                      | Ea. | Kick Plate                                                                                                                          | 8400 10" tall x 3" LDW (less door width) x B4E (beveled edges) x counter sunk where door allows                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 630 | IV |
| 1                                                                                                                                                                                                                                                                                      | Ea. | Wall Stop                                                                                                                           | 1270CV                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 626 | TR |
| 1                                                                                                                                                                                                                                                                                      | Ea. | Seal                                                                                                                                | S88D seals (head and jambs) by Pemko or approved seal manufacturer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |     |    |
| 1                                                                                                                                                                                                                                                                                      | Ea. | Auto Door Bottom                                                                                                                    | 423N for wood material doors (or submit 320N for metal doors) application as required per door material x DKB end caps by NGP or approved seal manufacturer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |     |    |
| 1                                                                                                                                                                                                                                                                                      | Ea. | Threshold (sound dampening)                                                                                                         | 410DKB (flat) by NGP or approved seal manufacturer (per specifications, provide full bed of mastic under all thresholds). Verify floor transition before ordering materials, final to be selected in submittals.<br><br><br><b>410</b> .36 lbs./ft.<br><b>410DKB</b> .36 lbs./ft.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |     |    |
| Note 2: Furnish and install all devices and components for hardware groups/set above in accordance with Contract Documents (including but not limited to additional hardware devices required in specifications language above, architectural plans and full specification documents). |     |                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |     |    |

Blank space below and after a Group/Set is intentional to avoid, if possible, splitting a Hardware Group/Set onto two pages

**Hardware Group/Set #106**

|   |     |                                          |                                                                                                                                        |     |    |
|---|-----|------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|-----|----|
| 1 | Ea. | Primus I/C Cylinders<br>(Rim or Mortise) | 20-757 or 20-763 x appropriate cam x blocking rings<br>as required (rim or mortise type and quantity as<br>required by locking device) | 626 | SC |
| 1 | Ea. | Permanent Core                           | 20-740                                                                                                                                 | 626 | SC |

Note 1: For doors/openings assigned this hardware group/set, the cylinder is for unit-type pricing. At each opening assigned this hardware group/set, provide final keying as required per locking and/or key control devices. After the door is installed, if door or doors assigned this hardware set require a key for locking or for turning on/off motors (like an off switch, just keyed), utilize the Unit Price cylinder and order the and install the required keyed cylinder at time of door is tested (fully functional doors at substantial completion).

Note 2: Furnish all devices & components for hardware groups/set above in accordance with Contract Documents (including but not limited to notes below, additional hardware devices requirements in the above specification language, architectural plans & full specification documents).

END OF SECTION

## SECTION 08 81 00

### GLASS GLAZING

#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Glass and glazing for windows and doors.

##### 1.2 RELATED SECTIONS

- A. Section 07 92 00 – Joint Sealants: Sealant and back-up material.
- B. Section 08 11 13 – Hollow Metal Door Frames: Glazed doors.
- C. Section 08 14 00 – Wood Doors: Glazed doors.
- D. Section 08 41 13 – Aluminum Framed Entrances and Storefronts.

##### 1.3 REFERENCES

- A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.
- B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.
- C. Referenced Standards:
  - 1. ASTM C920 – Standard Specification for Elastomeric Joint Sealants.
  - 2. ASTM C1036 – Standard Specification for Flat Glass.
  - 3. ASTM C1048 – Standard Specification for Heat-Treated Flat Glass – Kind HS, Kind FT Coated and Uncoated Glass.
  - 4. ASTM C1172 – Standard Specification for Laminated Architectural Flat Glass.
  - 5. ASTM C1279 – Standard Test Method for Non-Destructive Photoelastic Measurement of Edge and Surface Stresses in Annealed, Heat-Strengthened, and Fully Tempered Flat Glass.
  - 6. ASTM E1300 – Standard Practice for Determining Load Resistance of Glass in Buildings.

##### 1.4 SUBMITTALS

- A. Submit under provisions of Division 01.
- B. Product Data:
  - 1. Provide structural, physical, and environmental characteristics, size limitations, and special handling or installation requirements for each type of glazing specified.
  - 2. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, and special handling or installation requirements. Identify available colors.

- C. Submit documentation indicating that all tempered and laminated glazing to be installed on this project is certified by the Safety Glazing Certification Council.

#### 1.5 PERFORMANCE/DESIGN CRITERIA

- A. Glass Strength: Analysis shall comply with ASTM E1300, Determining Load Resistance of Glass in Buildings. Provide glass products in the thickness and strengths (annealed or heat treated) required to meet or exceed the following criteria based on project loads and in-service conditions.
  - 1. Minimum thickness of annealed or heat-treated glass products to be selected so the worst case probability of failure does not exceed the following:
    - a. 5 breaks per 1,000 for glass installed vertically or not 15 degrees or more from the vertical plane and under wind action.
    - b. 1 break per 1,000 for glass installed 15 degrees or more from the vertical plane and under action of wind and/or snow.
  - 2. Deflection must be limited to prevent disengagement from the frame and be less than or equal to 3/4 inch or L/175.

#### 1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with GANA Glazing Manual, and GANA Sealant Manual for glazing installation methods.
- B. Installer's Qualifications: The installation shall be performed only by an installation firm normally engaged in this business. All work shall be performed by qualified mechanics that specialize in glazing and glass installation.
- C. Safety glazing shall meet the requirements of 2025 CBC Section 2406 and shall be identified in accordance with 2025 CBC Sections 2403.1 and 2406.3, with identification etched in glass.
- D. Glass installation in frames shall comply with the Minimum Glazing Requirements in CBC Table 2403.2.1.

#### 1.7 JOB AND ENVIRONMENTAL CONDITIONS

- A. Do not install glazing when ambient temperature is less than 40 degrees F.
- B. Maintain minimum ambient temperature before, during, and 48 hours after installation of glazing compounds.

#### 1.8 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on shop Drawings.

#### 1.9 COORDINATION

- A. Coordinate Work with glazing frames, wall openings, and adjacent Work.

#### 1.10 WARRANTY

- A. Provide five-year limited warranty from date of manufacture for insulating units that are glazed in accordance with manufacturer's written glazing installation instructions.
- B. Provide five-year limited warranty for laminated glass.

## PART 2 PRODUCTS

### 2.1 GENERAL

- A. All glass shall be graded and meet requirements of ASTM C1036 and ASTM C1048, Type 1, quality q3. Each light of glass delivered and installed shall have affixed thereto the manufacturer's grade label.
- B. Glazing material installed in Hazardous Locations subject to human impact shall be certified and permanently labeled as meeting applicable requirements referenced in NFPA 80 and 2025 CBC Section 2406.
  - 1. CPSC 16 CFR 1201, Category I and II.

### 2.2 GLASS TYPES

- A. Float Glass:
  - 1. Acceptable Manufacturers:
    - a. Vitro Architectural Glass, Cheswick, PA; 855-887-6457, [www.vitroglazings.com](http://www.vitroglazings.com).
    - b. Oldcastle Building Envelope, Fremont, CA; 866-653-2278, [www.obe.com](http://www.obe.com).
    - c. Viracon, Owatonna, MN; 507-451-9555, [www.viracon.com](http://www.viracon.com).
    - d. Guardian Industries Holdings, [www.guardianglass.com/us](http://www.guardianglass.com/us).
    - e. Substitutions: Under provisions of Division 01.
  - 2. Material: 1/4 inch thick clear glass, tempered where required by CBC and where indicated on Drawings.
- B. Laminated Glass:
  - 1. Acceptable Manufacturers:
    - a. Vitro Architectural Glass, Cheswick, PA; 855-887-6457, [www.vitroglazings.com](http://www.vitroglazings.com).
    - b. Oldcastle Building Envelope, Fremont, CA; 866-653-2278, [www.obe.com](http://www.obe.com).
    - c. Viracon, Owatonna, MN; 507-451-9555, [www.viracon.com](http://www.viracon.com).
    - d. Guardian Industries Holdings, [www.guardianglass.com/us](http://www.guardianglass.com/us).
    - e. Substitutions: Under provisions of Division 01.
  - 2. Material: 9/32 inch thick clear laminated architectural glass produced by bonding a 0.060 inch thick Saflex PVB clear interlayer between one pane of 1/8 inch thick clear tempered glass and one pane of 1/8 inch thick clear tempered glass under heat and pressure.

### 2.3 GLAZING SEALANT

- A. Glazing Sealants: ASTM C920, Type S, Grade NS, Uses G and A. Dow Corning 795, Tremco Proglaze or GE Silicone Sealants; Tremco Mono acrylic sealant or accepted equal. All sealants shall be compatible with the type of glazing and window frame to which they are applied.

### 2.4 GLAZING ACCESSORIES

- A. Setting Blocks: Neoprene EPDM blocks with a Shore A durometer hardness of 85, plus minus 5 percent, chemically compatible with sealant used.

- B. Spacer Shims: Neoprene, 50-60 Shore A durometer hardness, minimum 3 inches long by one half the height of the glazing stop by thickness to suit application.
- C. Glazing Tape: 100 percent solids by weight, highly adhesive and elastic, cross-linked butyl rubber preformed tape with a continuous integral EPDM shim; 57 Shore 00 durometer hardness; black color; Tremco POLYshim II Tape or accepted equal.
- D. Glazing Splines: Resilient polyvinyl chloride extruded shape to suit glazing channel retaining slot; black color.
- E. Miscellaneous: Furnish all primers-sealers, setting blocks, shims, spacers, compression seals, etc., as required for a first class workmanlike job.

## 2.5 FABRICATION

### A. Flat Glass:

- 1. Comply with ASTM C1036 Standard Specification for Flat Glass, Type 1, Class 1 (clear) or Class 2 (tinted, heat-absorbing and light reducing) and Quality q3.
- 2. ASTM C1048 Heat Treated Flat Glass, Kind HS (heat-strengthened) or FT (fully tempered), Condition A (uncoated).
  - a. Heat Treated Flat Glass shall be produced by horizontal (roller hearth) process with inherent rollerwave distortion parallel to the bottom edge of the glass as installed.
  - b. Maximum peak to valley rollerwave 0.003 inch in the central area and 0.008 inch within 10.5 inches of the leading and trailing edge.
  - c. Maximum bow and warp 1/32 inch per lineal foot.
  - d. All heat strengthened glass shall have a surface compression of 3,500 psi to 7,500 psi. The surface compression shall be verified to meet ASTM C1279 requirements.
  - e. All tempered architectural safety glass shall have a minimum surface compression of 10,000 psi, an edge compression of not less than 9,700 psi, or conform to the requirements of ANSI Z97.1 and CPSC 16CFR-1201.

### B. Laminated Glass:

- 1. Comply with ASTM C1172 Standard Specification for Laminated Architectural Flat Glass.
- 2. All laminated architectural safety glass shall conform to ANSI Z97.1 and CPSC 16 CFR 1201.
- 3. Laminated glass products shall be fabricated free of foreign substances and air or glass pockets in autoclave with heat plus pressure.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify prepared openings for adequacy to receive glass.
- B. Verify that openings for glazing are correctly sized and within tolerance.
- C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.

D. Report in writing any conditions that may be detrimental to the Work.

### 3.2 PREPARATION

- A. Clean contact surfaces with solvent and wipe dry.
- B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- C. Check that glass is free of edge damage or face imperfections.

### 3.3 INSTALLATION

- A. General: Install glazing types at locations indicated on Drawings, according to glazing manufacturer's recommendations and as specified herein.
- B. Glass Glazing:
  - 1. Positioning Glass: Orient pattern and draw of glass pieces in same direction. Set all sheet glass so that any waves, etc. are horizontal.
  - 2. Orient heat-treated glass so that the roller wave is parallel to the window sill/header.
  - 3. Do not cut, nip, or abrade tempered glass.
  - 4. Gunnable sealants, when applied as a cap head, shall form a bevel or watershed away from the glass. When tape is used to the sightline, it shall form a watershed when compressed. Do not undercut a sealant, compound, or tape below the sightline. Tool and finish sealant as required. Used tooling solution recommended by the sealant manufacturer.
  - 5. Positive Contact:
    - a. When applying a heel bead, lap onto the glass a minimum of 3/16 inch.
    - b. When applying a toe bead, whether continuous or a corner seal, make certain it is large enough to contact both the glass and sash. Install the sealant prior to glass placement.
  - 6. Setting blocks shall be 1/16 inch less than the full rabbet width, minimum length of 4 inches and high enough to provide the recommended minimum bite and edge clearance for the glass. Center blocks at 1/4 points unless otherwise recommended by the glass manufacturer.
  - 7. Provide spacer-shims at a maximum of 24 inches on center.
  - 8. Clearances: Observe minimum face clearances, edge clearance, and glass bite as recommended by the glass and sealant manufacturers.
  - 9. Tape Installation: Do not install glazing tapes more than 1 day ahead of glass placement. Remove the paper backing from the tape only when the lite is ready to be installed. Do not stretch the tape to make it fit. Do not overlap the ends of the tape. Instead, butt ends together, and when corners are butted together, daub with sealant to assure a positive seal.
  - 10. Glazing tapes must be kept under proper compression.
  - 11. Glazing stops shall be installed so that stop or frame does not bear directly against glass.

### 3.4 CLEANING

- A. Clean work under provisions of Division 01.

- B. Remove glazing materials from finish surfaces.
- C. Remove temporary labels after work is complete.
- D. Clean glass.

### 3.5 PROTECTION OF FINISHED WORK

- A. Protect finished Work under provisions of Division 01.
- B. Replacement: At completion of construction and prior to its acceptance, all broken, cracked, excessively scratched, or otherwise imperfect glazing materials included under this Section shall be replaced with new glazing materials of the type specified, as directed by the Architect, and at no additional cost to the Owner.

END OF SECTION

SECTION 09 22 16  
NON-STRUCTURAL METAL FRAMING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Metal stud and joist framing and accessories at interior locations.

1.2 RELATED SECTIONS

- A. Section 07 92 00 – Joint Sealants.
- B. Section 08 11 13 – Hollow Metal Door Frames.
- C. Section 09 29 00 – Gypsum Board.
- D. Section 09 81 00 – Acoustic Insulation.

1.3 REFERENCES

- A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.
- B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.
- C. Referenced Standards:
  - 1. ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - 2. ASTM A1003 – Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.
  - 3. ASTM C645 – Standard Specification for Nonstructural Steel Framing Members.
  - 4. ASTM C754 – Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
  - 5. ASTM C1513 – Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections.

1.4 SUBMITTALS

- A. Submit under provisions of Division 01.
- B. Product Data: Submit data describing standard framing member materials and finish, product criteria, load charts, and limitations.
- C. Manufacturer's Written Installation Instructions: Submit special procedures, perimeter conditions requiring special attention.
- D. Evaluation Reports: For products not covered in SSMA or SFIA standards, submit manufacturer's current ICC report reviewed per the applicable building code.

## 1.5 SYSTEM DESCRIPTION

- A. Interior Walls and Ceilings: Metal stud and joist framing system with batt type acoustic insulation specified in Section 09 81 00 and interior gypsum board specified in Section 09 29 00.
- B. Maximum Allowable Deflection:
  - 1. 1:120 span at gypsum board finish.
- C. Wall and Ceiling Systems:
  - 1. Design to provide for movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.

## 1.6 QUALITY ASSURANCE

- A. Framing members shall be provided by a member of the Steel Stud Manufacturer's Association (SSMA) or Steel Framing Industry Association (SFIA).
- B. Perform Work in accordance with ASTM C754.
- C. Comply with 2025 CBC, Chapter 22A, Section 2206A.
- D. Form, fabricate, install, and connect components in accordance with ML/SFA 540.

## 1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section.
- B. Installer: Company specializing in performing Work of this Section.

## 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Notify manufacturer of damaged materials received. Do not install damaged materials.
- B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- C. Protect cold-formed metal framing products from corrosion, deformation, and other damage during delivery, storage, and handling as required by AISI's Code of Standard Practice.

## 1.9 COORDINATION

- A. Coordinate placement of components within stud framing system.

## PART 2 PRODUCTS

### 2.1 METAL FRAMING SYSTEM

- A. Acceptable Manufacturers:
  - 1. ClarkWestern Dietrich Building Systems LLC, West Chester, OH; 513-870-1100, [www.clarkdietrich.com](http://www.clarkdietrich.com).
  - 2. MarinoWARE, South Plainfield, NJ; 800-627-4661, [www.marinoware.com](http://www.marinoware.com).
  - 3. CEMCO, City of Industry, CA; 800-775-2362, [www.cemcosteel.com](http://www.cemcosteel.com).

4. SCAFCO Steel Stud Company, Spokane, WA; 509-343-9000, [www.scafco.com](http://www.scafco.com).

B. Substitutions: Under provisions of Division 01.

## 2.2 COMPONENTS

A. Framing System Components:

1. 20 Gauge and Thinner: Manufactured per ASTM C645 with material meeting the requirements of ASTM A1003, Type H (ST33H).
2. 18 Gauge: Manufactured with material meeting the requirements of ASTM A1003, Structural Grade 33, Type H (ST33H).
3. 16 Gauge and Thicker: Manufactured with material meeting the requirements of ASTM A1003, Structural Grade 50, Type H (ST50H).

B. Studs and Joists: ASTM A653/A653M non-load bearing rolled steel, channel shaped, punched for utility access, depths, gauges, and spacing as indicated on the Drawings.

C. Tracks and Headers: Same material and thickness as studs.

D. Slotted Track: Slotted track system for positive attachment of metal studs to track, for head-of-wall expansion joint movement, cyclic and static.

1. Forming steel shall conform to ASTM A1003, Structural Grade 33, Type H (ST33H).
2. Formed steel shall be galvanized in accordance with ASTM A653 for a Class G40 by the hot-dip process.
3. Slotted track shall be provided in standard widths and gauges, as required and indicated on Drawings. Down standing legs shall be nominally 2-1/2 inches and shall be provided with 1-1/2 inch slots at 1 inch on center.
4. Fasteners:
  - a. For attachment of studs to slotted track, minimum No. 8 corrosion resistant by 1/2 inch waferhead screws.
  - b. For attachment of slotted track to overhead structural element, as provided for the structural details affecting the work.
5. Product: MaxTrak at non-rated assemblies as manufactured by ClarkWestern Dietrich Building Systems LLC or accepted equal.

E. Furring and Bracing Members: Of same material as studs; thickness to suit purpose.

F. Sheet Metal Backing: 16 gauge, unless noted otherwise on Drawings.

G. Hat-Shaped, Rigid Furring Channels: ASTM C645, 7/8 inch deep.

H. Headers and Jambs: Manufacturer's proprietary shape used to form header beams and jambs, columns, or posts of web depths indicated, unpunched, with stiffened flanges.

I. Fasteners: ASTM C1513, self-drilling, self-tapping corrosion resistant screws.

J. Anchorage Devices: As indicated on Drawings.

K. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type II organic zinc rich.

## 2.3 FINISH

### A. Framing Members and Connections:

1. Provide galvanized finish per ASTM A653 with G40 minimum coating weight. No equivalent coatings allowed.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- #### A. Verify rough-in utilities are in proper location.

### 3.2 INSTALLATION

- A. Install metal framing per ASTM C754 and as indicated on Drawings.
- B. Align and secure top and bottom runners as indicated on Drawings.
- C. Place 2 beads of acoustic sealant between tracks and substrate, studs, and adjacent construction, to achieve acoustic seal.
- D. Place 2 beads of acoustic sealant between studs and adjacent vertical surfaces to achieve acoustic seal.
- E. Framing at openings shall be as shown on Drawings. Install intermediate studs at same spacing as wall studs.
- F. Install studs vertically at 16 inches on center unless otherwise noted on Drawings.
- G. Install joists horizontally at 16 inches on center unless otherwise noted on Drawings.
- H. Align stud web openings horizontally.
- I. Secure studs to tracks as indicated on Drawings.
- J. Stud splicing not permissible.
- K. Fabricate corners using minimum of 3 studs.
- L. Double stud at wall openings and door and window jambs, not more than 2 inches from each side of openings.
- M. Brace stud framing system rigid.
- N. Coordinate erection of studs with requirements of door frames and window frames; install supports and attachments.
- O. Backing/Blocking: Shall be provided for all wall and ceiling finishes and for the supporting and anchorage of products, fixtures, and equipment for all trades. Coordinate size, type, and location of backing and supports with manufacturer or supplier of items requiring backing/blocking.
- P. Refer to Drawings for indication of partitions extending stud framing through ceiling to structure above. Maintain clearance under structural building members to avoid deflection transfer to studs. Install extended leg top track for slip connection.

- Q. Refer to Drawings for indication of partitions extending to finished ceiling only and for partitions extending through ceiling to structure above. Maintain clearance under structural building members to avoid deflection transfer to studs; install extended leg top track for slip connection.
- R. Refer to Drawings for indication of partitions through ceiling, but not to structure above. Install diagonal stud bracing staggered at 48 inches on center to structure above. Stud bracing width and gauge shall match that of the stud framing below.
- S. Coordinate placement of insulation in stud spaces after stud frame erection.

### 3.3 ERECTION TOLERANCES

- A. Maximum Variation from Indicated Position: 1/8 inch in 10 feet (non-cumulative).
- B. Maximum Variation from Plumb: 1/8 inch in 10 feet (non-cumulative).

END OF SECTION



## SECTION 09 29 00

### GYPSUM BOARD

#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Type X gypsum board.
- B. Accessories.

##### 1.2 RELATED SECTIONS

- A. Section 07 92 00 – Joint Sealants.
- B. Section 08 11 13 – Hollow Metal Door Frames.
- C. Section 09 22 16 – Non-Structural Metal Framing.
- D. Section 09 65 00 – Resilient Wall Base.
- E. Section 09 68 13 – Tile Carpeting.
- F. Section 09 81 00 – Acoustic Insulation.
- G. Section 09 91 00 – Painting.
- H. Section 10 26 00 – Wall Protection.

##### 1.3 REFERENCES

- A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.
- B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.
- C. Referenced Standards:
  - 1. ASTM C475/C475M – Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
  - 2. ASTM C840 – Standard Specification for Application and Finishing of Gypsum Board
  - 3. 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.
  - 4. 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.

- 5. ASTM C1047 – Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
- 6. ASTM C1396/C1396M – Standard Specification for Gypsum Board.
- 7. GA-214 – Levels of Finish for Gypsum Panel Products.
- 8. GA-216 – Application and Finishing of Gypsum Panel Products.

#### 1.4 SUBMITTALS

- A. Submit under provisions of Division 01.
- B. Product Data: Submit product data for each product specified in this Section with the product and selected attributes clearly identified.

#### 1.5 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Manufacturer Qualifications: Firm specializing in manufacturing products specified in this Section with a minimum five years' experience.
  - 2. Installer Qualifications: Firm specializing in installing work specified in this Section acceptable to manufacturer with experience on at least 5 projects of similar nature in past three years.
- B. Regulatory Requirements: Comply with requirements of CBC Chapter 25.
- C. Coordinate work in this Section with work in related Sections.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Division 01.
- B. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact.
- C. Storage and Protection: Store materials in a dry secure place; neatly stacked to prevent sagging or damage to edges, ends, and surfaces. Protect from weather, surface contaminants, corrosion, construction traffic, and other potential damage.

#### 1.7 ENVIRONMENTAL REQUIREMENTS

- A. Interior Environmental Requirements:
  - 1. Maintain room temperature at not less than 40 degrees F during application of gypsum board. Maintain room temperature at not less than 50 degrees F for joint treatment, texturing, and decoration for 48 hours prior to and continuously thereafter until completely dry.
  - 2. Provide adequate ventilation during installation and curing period.
  - 3. Prevent exposure to excessive or continuous moisture before, during, and continuously after installation. Eliminate sources of moisture immediately.
  - 4. Protect gypsum board from direct exposure to rain, snow, sunlight, or excessive weather conditions.

## PART 2 PRODUCTS

### 2.1 SUSTAINABLE BUILDING DESIGN REQUIREMENTS

- A. Provide sealants that meet VOC requirements of South Coast Air Quality Management District (SCAQMD) Rule 1168. Information is available at [www.aqmd.gov](http://www.aqmd.gov).

### 2.2 MANUFACTURERS

A. Acceptable Manufacturers:

1. USG Corporation, Chicago, IL; 800-874-4968, [www.usg.com](http://www.usg.com).
2. National Gypsum Services Company, Charlotte, NC; 704-365-7300, [www.nationalgypsum.com](http://www.nationalgypsum.com).
3. Georgia-Pacific, Atlanta, GA; 404-652-4000, [www.gp.com](http://www.gp.com).
4. CertainTeed, a Division of Saint-Gobain, Malvern, PA; 800-233-8990, [www.certainteed.com](http://www.certainteed.com).
5. PABCO Gypsum, Rancho Cordova, CA; 866-282-9298, <https://pabco gypsum.com>.

B. Substitutions: Under provisions of Division 01.

### 2.3 GYPSUM BOARD

- A. Type X Gypsum Board: ASTM C1396/1396M; 5/8-inch thick; 2.2 pounds per square foot; fire resistant core; maximum permissible length; ends square cut, tapered edges.

1. Acceptable Products:

- a. Sheetrock Brand Firecode X manufactured by USG Corporation,
- b. Gold Bond Brand XP Fire-Shield Gypsum Board manufactured by National Gypsum Services Company.
- c. ToughRock Fireguard manufactured by Georgia-Pacific,
- d. CertainTeed Type X manufactured by CertainTeed,
- e. FLAME CURB Type X Gypsum Board manufactured by PABCO Gypsum,
- f. Or accepted equal.

### 2.4 ACCESSORIES

- A. Corner Bead and Edge Trim: ASTM C1047; zinc-coated sheet steel. Acceptable product: 103 Deluxe Corner Bead manufactured by ClarkWestern Dietrich Building Systems LLC or accepted equal.

- B. Control Joints: ASTM C1047; roll-formed zinc joint with removable protected opening. Acceptable product: Zinc Control Joint No. 093 manufactured by ClarkWestern Dietrich Building Systems LLC or accepted equal.

C. Screws:

1. ASTM C1002, Type S or Type A; bugle head; self-drilling and self-tapping screws for light gauge steel framing (less than 0.033 inch thick).
2. ASTM C954; bugle head; self-drilling and self-tapping screws for heavy gauge steel framing (0.033 inch to 0.112 inch thick).

- D. Jointing Tape: ASTM C475/C475M; 2 inch wide cross-fibered paper joint tape.
- E. Joint Compound: ASTM C475/C475M.
- F. Primer-Surfacer (used in lieu of skim coat in a Level 5 finish): High-build interior coating finish applied with an airless sprayer. Products: Sheetrock Brand Primer-Surfacer Tuff-Hide manufactured by USG Corporation, ProForm Brand Surfacer/Primer manufactured by National Gypsum Services Company, or accepted equal. Note: Walls applied with primer-surfacer do not require drywall paint primer prior to application of finish coats.
- G. Acoustical Sealant: Refer to Section 07 92 00.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Examine job site conditions and verify field dimensions.
- B. Verify framing for acceptable placement, spacing, and tolerance (alignment and plumb).
- C. Verify that framing and furring are securely attached.
- D. Verify that all blocking, headers, and supports are in place to support wall mounted items.
- E. Verify that insulation is secured.
- F. Report unacceptable conditions to the Architect. Begin installation only when unacceptable conditions have been corrected.

### 3.2 INSTALLATION – SEALANTS

- A. Apply acoustical sealant at partitions per sealant manufacturer's written installation instructions. Refer to Section 07 92 00.

### 3.3 INSTALLATION – GYPSUM BOARD

- A. Install gypsum board to framing and furring members in accordance with manufacturer's recommendations, GA-216 or ASTM C840, and as specified in this Section.
- B. Install gypsum board with separate panels in moderate contact, do not force in place. Stagger end joints of adjoining panels. Neatly fit abutting end and edge joints.
  - 1. Where two layers of gypsum board are installed, stagger all joints in top layer over joints in first layer.
- C. Install gypsum board in most economical direction, using maximum practical lengths, with edges occurring over firm bearing. Install 1/4 inch (nominal) above rough floor or curb. Cut out gypsum board as required to make neat close joints around openings.
- D. In vertical applications, provide lengths required to reach full height of vertical surfaces in one continuous piece.
- E. Where gypsum board is carried full height to structure above, provide for deflection of structure by undercutting board 3/8 inch (nominal) and sealing top edge of board to substrate with a continuous bead of sealant to form an elastic closure.

- F. Use screws to fasten gypsum board to framing.
- G. Treat cut edges and holes in moisture resistant gypsum board per manufacturer's recommendations.
- H. Place corner beads at all exterior corners. Use longest practical length. Place edge trims where gypsum board abuts dissimilar materials.
- I. Control Joints: Install control joints where indicated on the Drawings. Where not specifically indicated, install consistent with lines of building spaces as directed by Architect; and as a minimum, install as follows:
  - 1. Where a partition, wall, or ceiling traverses a construction joint (expansion, seismic, or building control element) in the base building structure.
  - 2. Where a wall or partition runs in an uninterrupted straight plane exceeding 30 linear feet.
  - 3. In interior ceilings with perimeter relief so that linear dimensions between control joints do not exceed 50 feet and total area between control joints does not exceed 2500 square feet.
  - 4. In interior ceilings without perimeter relief so that linear dimensions between control joints do not exceed 30 feet and total area between control joints does not exceed 900 square feet.
  - 5. Where ceiling framing members change direction.
  - 6. Where a partition transitions from floor-supported framing to overhead hung framing.
- J. Attach metal corner beads, edge trim, decorative dividers, and control joints to the supporting construction at 9 inches on center maximum spacing using same fasteners used to attach gypsum board panels.

#### 3.4 JOINT TREATMENT AND FINISH TEXTURE

- A. Finish gypsum board surfaces in accordance with ASTM C840, GA-214, and GA-216.
- B. Remove dirt, oil, and other materials that may cause lack of bond from all surfaces to receive joint compound.
- C. Set mechanical fasteners below the plane of the board.
- D. Tape, fill, and sand all joints, edges, and corners to produce smooth surface ready to receive finishes. Fill all dents, gouges, recesses, or other depressions with joint compound to produce a monolithic surface.
- E. Feather coats onto adjoining surfaces so that camber is maximum 1/32-inch.
- F. Spray apply texture on gypsum board surfaces where required to match existing adjacent texture.
- G. Levels of Finish: Finish gypsum board surfaces in accordance with GA-214 and with the table on the following page.

| Area                                                       | Finish                                                                                                                                      |
|------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Plenum areas above ceilings.                               | Level 1 finish, no texture.                                                                                                                 |
| Wall covering such as sheet wall protection and laminates. | Level 4 finish, no texture.                                                                                                                 |
| Light texture (match existing); flat paint finish.         | Level 4 finish.                                                                                                                             |
| Smooth finish; satin/eggshell paint finish.                | Level 4 finish.<br>Level 5 finish where critical (severe) lighting condition occurs (refer to GA-214 for description of critical lighting). |
| Smooth finish; semi-gloss and gloss paint finish.          | Level 5 finish.                                                                                                                             |

### 3.5 TOLERANCES

- A. Maximum Variation from True Flatness: 1/8 inch in 10 feet in any direction.

### 3.6 CLEANING AND PROTECTION

- A. Cleaning and Repair: Clean surfaces that have been spotted or soiled during gypsum board application.
- B. Defective Work: Remove and replace defective work that cannot be satisfactorily repaired, at the direction of the Architect, with no additional cost to the Owner.
- C. Protection: Protect installed work against damage from other construction work.
- D. Upon completion of the work under this Section, remove all surplus material, rubbish, and debris from the premises and leave floors broom clean.

END OF SECTION

SECTION 09 51 13  
ACOUSTICAL PANEL CEILINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Suspended metal grid ceiling system.
- B. Lay-in acoustical panels.
- C. Accessories.

1.2 RELATED SECTIONS

- A. Section 09 29 00 – Gypsum Board.
- B. Division 23 – Mechanical.
- C. Divisions 26 – 28 – Electrical.

1.3 REFERENCES

- A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.
- B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.
- C. Referenced Standards:
  - 1. ASCE 7-22 – Minimum Design Loads and Associated Criteria for Buildings and Other Structures.
  - 2. ASTM A641/A641M – Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
  - 3. ASTM C635 – Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings.
  - 4. ASTM C636 – Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
  - 5. ASTM D610 – Standard Practice for Evaluating Degree of Rusting on Painted Steel Surfaces.
  - 6. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
  - 7. ASTM E580 – Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels in Areas Subject to Earthquake Ground Motions.
  - 8. ASTM E1264 – Standard Classification for Acoustical Ceiling Products

9. ASTM E1399 – Standard Test Method for Cyclic Movement and Measuring the Minimum and Maximum Joint Widths of Architectural Joint Systems.

#### 1.4 SUBMITTALS

- A. General: Submit in accordance with Division 01.
- B. Product Data: Provide data on metal grid system components, compression struts, and acoustical units with the specified products and selected attributes clearly identified.
- C. Manufacturer's Written Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

#### 1.5 SYSTEM DESCRIPTION

- A. Performance Requirements: Rigidly secure suspended acoustical ceiling system, including integral mechanical and electrical components with maximum deflection of 1/360.

#### 1.6 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Metal Suspension Grid Manufacturer Qualifications: Firm specializing in manufacturing products specified in this Section with a minimum ten years' experience.
  - 2. Lay-In Acoustical Tile Manufacturer Qualifications: Firm specializing in manufacturing products specified in this Section with a minimum ten years' experience.
- B. Single Source Responsibility: Provide metal suspension systems and lay-in acoustical panels from a single manufacturer to ensure system compatibility and quality, and to comply with manufacturer's warranty requirements.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Division 01.
- B. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact.
- C. Storage and Protection: Store materials in a dry secure place. Protect from weather, surface contaminants, construction traffic, and other potential damage.

#### 1.8 ENVIRONMENTAL REQUIREMENTS

- A. Maintain 60 degrees F minimum uniform temperature and 20 percent to 40 percent relative humidity prior to, during, and after installation of acoustical lay-in tiles.

#### 1.9 SEQUENCING

- 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. Install acoustical units after interior wet work is dry.

#### 1.10 EXTRA MATERIALS

- A. Furnish in accordance with Division 01.
- B. Provide 10 percent extra of each type of panel.

#### 1.11 WARRANTIES

- A. Metal Suspension Systems: Suspension system shall be warranted to be free from defects in materials or factory workmanship and warranted against the occurrence of 50 percent red rust as designated by ASTM D610 test procedures for a period of ten years from the date of installation.
- B. Acoustical Panels: Panels shall be warranted to be free from defects in materials or factory workmanship, or sagging and warping as a result thereof, for one year from the date of installation.

### PART 2 PRODUCTS

#### 2.1 MANUFACTURERS

- A. Acceptable Manufacturers – Metal Suspension Systems:
  - 1. Armstrong World Industries, Inc., Lancaster, PA; 888-234-5464, [www.armstrong.com](http://www.armstrong.com). Refer to ICC ESR-1308.
    - a. Fine Fissured Second Look Scored Tegular Medium Texture No. 1761: CL1.
  - 2. USG Corporation, Chicago, IL; 800-874-4968, [www.usg.com](http://www.usg.com). Refer to ICC ESR-1222.
  - 3. CertainTeed, a Division of Saint-Gobain, Malvern, PA; 800-233-8990, [www.certainteed.com](http://www.certainteed.com). Refer to ICC ESR-3336.
- B. Acceptable Manufacturers – Lay-in Acoustical Panels:
  - 1. Armstrong World Industries, Inc., Lancaster, PA; 717-397-0611, [www.armstrong.com](http://www.armstrong.com)
  - 2. USG Corporation, Chicago, IL; 800-874-4968, [www.usg.com](http://www.usg.com).
  - 3. CertainTeed, a Division of Saint-Gobain, Malvern, PA; 800-233-8990, [www.certainteed.com](http://www.certainteed.com).
- C. Substitutions: Under provisions of Division 01.

#### 2.2 METAL SUSPENSION SYSTEM

- A. Metal Suspension Grid: ASTM C635, heavy-duty classification in compliance with ASCE 7-22 13.5.6.2; hot-dipped galvanized steel (minimum G30); 15/16 inch face; structural tee main and cross members; capped with steel, coated with factory applied baked-on white enamel paint.
  - 1. Main runners, cross runners, splices, expansion devices, and intersection connectors shall be designed to carry a mean ultimate test load of not less than 180 pounds in compression and tension per ASTM E580.

B. Products, Suspension System:

|                                | Main Runner  | Cross Tees                  |
|--------------------------------|--------------|-----------------------------|
| 1. Armstrong Prelude XL        | 7301         | XL7342 and XL7328           |
| 2. USG Donn DX                 | DX26         | DX424 and DX216             |
| 3. CertainTeed EZ Stab Classic | EZCS12-12-20 | EZCS2-12-12 and EZCS4-12-12 |

C. Products, Suspension System Accessories:

|                | Wall Angle | Seismic Clip at Wall Angle |
|----------------|------------|----------------------------|
| 1. Armstrong   | 7800       | BERC2                      |
| 2. USG Donn    | M7         | ACM7                       |
| 3. CertainTeed | WA14-14    | CTSPC-2                    |

## 2.3 ACCESSORIES – METAL SUSPENSION SYSTEM

- A. Metal suspension system accessories as required for a complete system including, but not limited to, moldings, stabilizer bars, splices, hold down clips, and light fixture clips.
- B. Wire Hangers: ASTM A641/A641M, zinc-coated wire, Class 1, soft temper, pre-stretched, with a yield stress of at least 3 times the design load; sizes and gauges as shown on the Drawings and as specified in this Section.
- C. Support Channels and Hangers: Galvanized primed steel (minimum G30); size and type to suit application and to meet seismic requirements and as specified in this Section.
- D. Seismic Isolation Joints:
  1. Acceptable Manufacturers:
    - a. Balco, Wichita, KS; 800-767-0082, [www.balcousa.com](http://www.balcousa.com). Product: AC Accordion Acoustical Ceiling with 100 percent movement.
    - b. MM Systems, Pendergrass, GA; 800-241-3460, <https://mmsystemscorp.com>.
    - c. Watson Bowman Acme, a Division of Sika, Amherst, NY; 800-677-4922, [www.watsonbowmanacme.com](http://www.watsonbowmanacme.com).
    - d. InPro, Muskego, WI; 800-222-5556, [www.inprocorp.com](http://www.inprocorp.com).
    - e. Substitutions: Under provisions of Division 01.
  2. Materials:
    - a. Variable extruded white Santoprene seal fixed between 2 extruded aluminum frames. Seal shall allow 100 percent expansion/contraction movement and 100 percent vertical shear movement in conformance with ASTM E1399. Color as selected by Architect.

## 2.4 ACOUSTICAL LAY-IN PANELS

A. Panel Type CL1:

1. ASTM E1264, Type A, Form A1.2; Pattern D.
2. Material: Wet-formed mineral fiber with factory-applied latex paint finish. Scored geometric visual with standard acoustical performance.

3. Properties:

- a. Color: White.
- b. Light Reflectance: Minimum 0.82.
- c. NRC: Minimum 0.55.
- d. Fire Resistance: CBC Class A (NFPA Class A); Flame Spread: 25 or under; Smoke Developed: 50 or under per ASTM E84.

4. Products:

|                                                    | Size (ft x ft x in thick) | Edge               |
|----------------------------------------------------|---------------------------|--------------------|
| Armstrong Fine Fissured Second Look No. 1761       | 2 x 4 x 3/4               | Angled Tegalur     |
| USG Radar Illusion, No. 2842                       | 2 x 4 x 3/4               | Shadowline Tapered |
| CertainTeed Fine Fissured Customline, No. FFCL-224 | 2 x 4 x 3/4               | Reveal             |

B. Accessories – Acoustical Lay-In Panels:

- 1. Touch-Up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine job site conditions and verify field dimensions. Verify hangers will not interfere with other work.

3.2 INSTALLATION – SUSPENDED CEILING METAL GRID

- A. Install in accordance with manufacturer's written installation instructions, DSA IR 25-2, CBC Sections 808.1 and 1617.11.16, ASTM C635, ASTM C636, ASTM E580, ASCE 7-22 13.5.6.2, accepted shop drawings, and as specified in this Section.
- B. Install ceiling metal suspension system after major above ceiling work is complete. Coordinate location of hangers with other work.
- C. Hang suspension system independent of walls, columns, ducts, cable trays, pipes, and conduits.
- D. Use minimum 12 gauge hanger wires for up to and including 4 foot by 4 foot grid spacing attached to main runners.
- E. Provide 12 gauge hanger wires at the perimeter ends of all main and cross runners within 8 inches of the support or within 1/4 of the length of the end tee, whichever is least. End connections for runners which are designed and detailed to resist the applied vertical and horizontal forces may be used in lieu of the 12 gauge hanger wires, subject to DSA review and approval.
- F. Provide trapeze or other supplementary support members at obstructions to typical hanger spacing. Provide additional hangers, struts, or braces as required at all ceiling breaks, soffits, or discontinuous areas. Where hanger wires are more than 1 in 6 out of plumb, provide counter-sloping wires.

- G. Ceiling grid members shall be attached to 2 adjacent walls using seismic clips, and at least 3/4 inch free of other walls. Where walls run diagonally to ceiling grid system runners, 1 end of main and cross runner should be free, and a minimum 3/4 inch clear of wall.
- H. At ceiling perimeter area, where main or cross runners are not connected to adjacent walls, provide interconnection between runners at the free end to prevent lateral spreading. A metal strut or a 16 gauge wire with positive mechanical connection to the runner may be used. Interlock is not required where perpendicular distance from the wall to the first parallel runner is 8 inches or less.
- I. Wall angles shall be positively attached to wall studs or blocking.
- J. Seismic clips shall be attached to wall angles with a minimum of 2 screws and shall be installed around the entire ceiling perimeter.
  - 1. Pop rivets may be used in lieu of seismic clips at fixed sides where permitted by Evaluation Report.
- K. Expansion joints shall be provided in the ceiling at the intersections of corridors and at junctions of corridors and lobbies or other similar areas.
- L. Where ceiling areas exceed 2,500 square feet, a seismic separation joint shall be provided to divide the ceiling into areas not exceeding 2,500 square feet. Alternatively, comply with ASTM E580.
- M. Penetrations through the ceiling panels for fire sprinkler heads, pipes, conduits, and other similar devices that are not integrally tied to the ceiling system in the lateral direction shall have a 2 inch oversized color matching escutcheon plate, ring, sleeve, or adapter through the ceiling panel to allow free movement of 1 inch in all directions.
  - 1. Alternatively, a flexible fire sprinkler hose fitting that can accommodate 1 inch of ceiling movement per ASTM E580 may be used at fire sprinkler heads.
- N. Provide bracing assemblies consisting of a compression strut and four 12 gauge splayed bracing wires oriented 90 degrees from each other. Splayed bracing wires shall be taut and shall not exceed 45 degrees from the ceiling plane. Splices in bracing wires are not permitted. Space bracing assemblies as follows:
  - 1. Not more than 8 feet by 12 feet on center.
  - 2. Not more than 1/2 of the spacing given above from the perimeter wall and at the edge of vertical ceiling offsets.
  - 3. Suspended acoustical ceiling systems with a ceiling area of 144 square feet or less surrounded by walls which connect directly to the structure above, do not require bracing assemblies when attached to 2 adjacent walls.
- O. Compression struts shall be adequate to resist the vertical component induced by the bracing wires and shall not be more than 1 horizontal in 6 vertical out of plumb.
- P. Fasten hanger wires with not less than 3 tight turns in 3 inches. Fasten bracing wires with 4 tight turns in 1-1/2 inches. Install hanger or bracing wire anchors to the structure in a manner that the direction of the wire aligns as closely as possible to the direction of the forces acting on the wire.
- Q. Separate all ceiling hanging and bracing wires at least 6 inches from all unbraced ducts, pipes, conduit, etc.

- R. When drilled-in concrete anchors or shot-in anchors are used in reinforced concrete for hanger wires or when drilled-in concrete anchors are used in reinforced concrete for bracing wires, refer to Drawings for testing frequency and tension test load values. Shot-in anchors in concrete are not permitted for bracing wires. Refer to CBC Chapter 19A if any shot-in or drilled-in anchor fails.
1. Concrete Anchorage Requirements:
    - a. Anchorage to Concrete: Conform to requirements of CBC Chapter 19A.
    - b. Tests for Post-Installed Anchors in Concrete: Conform to CBC Chapter 19A.
- S. Attach all light fixtures, ceiling mounted air terminals or services, light-weight miscellaneous devices, such as strobe lights, speakers, etc., and all other devices to the ceiling grid runners to resist a horizontal force equal to the weight of the fixtures. Screw or approved fasteners are required. A minimum of 2 attachments are required per ASTM E580.
1. Devices weighing less than or equal to 10 pounds shall have a 12 gauge slack safety wire anchored to the structure above.
- T. Flush or recessed light fixtures, air terminals or services, and flexible fire sprinkler hose fittings weighing more than 10 pounds and less than 56 pounds, shall be supported directly on the runners of a heavy-duty grid system. In addition, provide two 12 gauge slack safety wires attached to the fixture at diagonal corners and anchored to the structure above. 1 foot by 1 foot light fixtures shall have slack safety wires at each corner.
- U. Flush or recessed light fixtures, air terminals or services, and flexible fire sprinkler hose fittings weighing 56 pounds or more shall be independently supported by not less than 4 taut 12 gauge wires attached to the fixture and to the structure above.
- V. Surface-mounted fixtures shall be attached to the main runner with at least 2 positive clamping devices made of minimum 14 gauge material. Rotational spring catches are not allowed. A 12 gauge suspension wire shall be attached to each clamping device and be attached to the structure above. Provide additional supports when light fixtures are 8 feet or longer. Maximum spacing between supports shall not exceed 8 feet.
- W. Support pendant mounted light fixtures directly from structure above with hanger wires or cables passing through each pendant hanger and capable of supporting 2 times the weight of the fixture. A bracing assembly is required where the pendant hanger penetrates the ceiling. Attach pendant hanger to bracing assembly in a manner to transmit horizontal force. Where the pendant mounted light fixture is directly and independently braced below the ceiling, such as with aircraft cables to walls, the brace assembly is not required above the ceiling.
- X. Do not eccentrically load suspended ceiling grid system or produce rotation of runners.
- Y. Install edge molding at intersection of ceiling and vertical surfaces, using longest practical lengths. Miter corners; provide edge moldings at junctions with other interruptions.

### 3.3 INSTALLATION – LAY-IN CEILING PANELS

- A. Install units in accordance with manufacturer's written installation instructions.
- B. Fit units in place, free from damaged edges, or other defects detrimental to appearance and function.

- C. Cut units to fit irregular grid and perimeter edge trim. Double cut and field paint exposed edges of tegular units in matching color.
- D. Lay directional patterned units one way with pattern parallel to longest room axis. Fit border trim neatly against abutting surfaces.
- E. Install units after above ceiling work is complete.
- F. Install units level, in uniform plane, and free from twist, warp, and dents.
- G. Install hold-down clips to retain units tight to grid system within 10 feet of all exterior doors.

#### 3.4 ERECTION TOLERANCES

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

#### 3.5 CLEANING

- A. Clean as recommended by manufacturer. Do not use materials or methods which may damage finish surface or surrounding construction.

END OF SECTION

SECTION 09 65 00  
RESILIENT WALL BASE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Resilient wall base, rubber.
- B. Accessories.

1.2 RELATED SECTIONS

- A. Section 09 29 00 – Gypsum Board; for wall materials to receive resilient base.

1.3 REFERENCES

- A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.
- B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.
- C. Referenced Standards:
  - 1. ASTM E648 – Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
  - 2. ASTM E662 – Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
  - 3. ASTM F1861 – Standard Specification for Resilient Wall Base.

1.4 SUBMITTALS

- A. Submit under provisions of Division 01.
- B. Provide product data on specified products, describing physical and performance characteristics, sizes, patterns, and colors with the product and selected attributes clearly identified.
- C. Samples: The following physical sample requirements shall be waived if the products specified in Part 2 are submitted.
  - 1. Submit 2 4-inch long samples of wall base material of each color specified; include preformed or job-formed corners, as applicable.
- D. Submit manufacturer's written installation instructions under provisions of Division 01.

1.5 JOB AND ENVIRONMENTAL CONDITIONS

- A. Store materials for three days prior to installation in area of installation to achieve temperature stability.

- B. Maintain ambient temperature required by adhesive manufacturer 3 days prior to, during and 24 hours after installation of materials.

#### 1.6 OPERATION AND MAINTENANCE DATA

- A. Submit cleaning and maintenance data under provisions of Division 01.

#### 1.7 EXTRA MATERIALS

- A. Provide 20 lineal feet of wall base of each material and color specified, under provisions of Division 01.

### PART 2 PRODUCTS

#### 2.1 MANUFACTURERS AND PRODUCTS, RESILIENT WALL BASE

##### A. Acceptable Manufacturers:

1. Tarkett, Solon, OH; 800-899-8916, <https://commercial.tarkett.com>. Product: Johnsonite Millwork Wall Base.
2. Roppe Corporation, Fostoria, OH; 800-537-9527 <https://roppe.com>.
3. Mannington, Calhoun, GA; 800-356-6787, [www.manningtoncommercial.com](http://www.manningtoncommercial.com).
4. Substitutions: Under provisions of Division 01.

##### B. Wall Base Materials:

1. Wall Base: ASTM F1861, Type TP, Group 1 (rubber, thermoplastic).
2. Style: Cove (base with toe), top set.
3. Height: 4 inches, unless otherwise indicated.
4. Thickness: 1/8 inch, minimum.
5. Lengths: Coils in manufacturer's standard length.
6. Colors: As indicated on Drawings; if not indicated, as selected by Architect.

##### C. Wall Base Accessories:

1. Preformed end stops, and outside corners, of the same material, manufacturer, size, and color as wall base.
2. Adhesive: Water-based type, as recommended by base manufacturer for substrates indicated.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

- A. Verify that surfaces are smooth and flat with maximum variation of 3/16 inch in 10 feet and are ready to receive Work.
- B. Beginning of installation means acceptance of existing substrate and site conditions.

#### 3.2 PREPARATION

- A. Clean substrates to be covered immediately before installing resilient wall base.

### 3.3 INSTALLATION

#### A. Resilient Wall Base:

1. Install resilient wall base on entire wall perimeter including toe spaces and open ends of cabinets. Set all bases in adhesive as recommended by the manufacturer. All joints in bases, including those at any preformed corners, shall be plumb, flush, tight, and inconspicuous. Seat top edge and back of base firmly against the wall.
2. Fit joints tight and vertical. Maintain minimum measurement of 18 inches between joints.
3. Corners and Ends:
  - a. At external corners, use preformed units. Install preformed corners before installing straight pieces.
  - b. Interior corners shall be mitered and tightly fitted. Use straight pieces of maximum lengths possible.
4. At exposed ends use preformed units.
5. Install base on solid backing. Bond tight to wall and floor surfaces.
6. Scribe and fit to door frames and other interruptions.
7. Do not stretch resilient base during installation.

### 3.4 CLEANING, SEALING, AND POLISHING

- A. Remove excess adhesive from base and wall surfaces without damage. Sweep and vacuum surfaces thoroughly.
- B. Clean wall base surfaces by wiping with soft cloth dampened with warm water.

### 3.5 PROTECTION

- A. Comply with manufacturer's written installation instructions for protection of resilient wall base.
- B. Protect wall base from damage during construction operations for the remainder of the construction period.

END OF SECTION



SECTION 09 68 13  
TILE CARPETING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Modular carpet tile.
- B. Accessories.

1.2 RELATED SECTIONS

- A. Section 09 65 00 – Resilient Wall Base.

1.3 REFERENCES

- A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.
- B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.
- C. Referenced Standards:
  - 1. ASTM D1308 – Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Coating Systems.
  - 2. ASTM E648 – Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
  - 3. ASTM E662 – Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
  - 4. ASTM F710 – Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.
  - 5. ASTM F2170 – Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using In Situ Probes.
  - 6. CRI 104 – Standard for Installation of Commercial Carpet.

1.4 SUBMITTALS

- A. Submit under provisions of Division 01.
- B. Product Data: Submit product data for each product specified in this Section with the product and selected attributes clearly identified.
- C. Submit 2 full size samples illustrating color and pattern for each carpet material specified. Samples shall be labeled to indicate product name, weight, thickness, weave, and manufacturer's name.
  - 1. Physical sample requirements shall be waived if the product specified by manufacturer and product number is submitted.

- D. Submit manufacturer's written installation instructions.
- E. Submit manufacturer's written Warranty.

#### 1.5 QUALITY ASSURANCE

- A. Concrete slabs to receive tile carpeting shall conform to applicable requirements of ASTM F710.
- B. Manufacturer: Company specializing in commercial carpet tile with sufficient documented experience.
- C. Installer: Company with sufficient documented experience, approved by manufacturer. All work shall be performed by qualified and experienced mechanics working under the supervision of an experienced supervisor.
- D. A certification provided by carpet tile manufacturer shall be furnished to Owner stating that register numbers on carpet tile furnished was manufactured in accordance with these specifications.

#### 1.6 MAINTENANCE DATA

- A. Submit 3 copies of manufacturer's maintenance data for commercial installation to Owner in an 8-1/2 by 11 inch hard cover binder.
- B. Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, vacuum cleaning, shampooing, and recommended type of furniture casters and glides for use with specified carpet tile products.

#### 1.7 REGULATORY REQUIREMENTS

- A. Carpet tile work shall conform to applicable requirements of Americans with Disabilities Act (ADA), Article 4.5.
- B. Carpet work shall comply with 2025 California Building Code, Chapter 11B, Accessibility to Public Buildings, Public Accommodations, Commercial Buildings and Public Housing, Section 11B-302 "Floor or Ground Surfaces", Section 11B-303, "Changes in Level", and Section 11B-302.2, "Carpet" requirements.
  - 1. Carpet tile edges and trim shall conform to CBC Section 11B-302.2 and Section 11B-303 requirements.
  - 2. Fasten exposed edges to floor surfaces with trim along that edge.
  - 3. Carpet tile shall have a level loop, textured loop, level cut pile, or level cut/uncut pile; height (measured from bottom of tuft) not to exceed 1/2 inch.
  - 4. Carpet tile with a pile height exceeding 1/2 inch above adjoining floor surface, shall have a transition ramp between the surfaces.
- C. Carpet shall meet testing requirements of ASTM E648 and ASTM E662.
  - 1. Fire Test Response Characteristics: Provide products with the critical radiant flux classification indicated in Part 2, as determined by testing identical products per ASTM E648 and ASTM E662 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

## 1.8 JOB AND ENVIRONMENTAL CONDITIONS

- A. Comply with CRI 104, Section 7.2, Site Conditions; Temperature and Humidity and Section 7.12, Ventilation.
- B. Store materials for 3 days prior to installation in area of installation to achieve temperature stability.
- C. Environmental Limitations: Do not install carpet until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
  - 1. Maintain minimum 70 degrees F ambient temperature at floor level 3 days prior to, during, and 24 hours after installation of materials.
- D. Carpet tiles shall be delivered to job site in original mill wrappings, with each box having register number and tags attached, or register number intact.

## 1.9 EXTRA MATERIALS

- A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
- B. Provide full size units equal to 5 percent of the total area of carpeting, but not less than 10 square yards, of each type and color specified. Extra materials shall be packaged, identified, and delivered to Owner under provisions of Division 01.

## 1.10 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer's standard form in which manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
  - 1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
  - 2. Failures include, but are not limited to, more than 10 percent loss of face fiber, edge raveling, snags, runs, loss of tuft bind strength, dimensional stability, excess static discharge, and delamination.
  - 3. Warranty Period: Manufacturer's Lifetime Commercial Limited Warranty.
- B. Provide installer's two-year warranty commencing from the date of Project Completion.
- C. Submit warranty to Architect, under provisions of Division 01.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS AND PRODUCTS

- A. Acceptable Manufacturers:
  - 1. Mohawk Group, Calhoun, GA; 800-622-6228, [www.mohawkgroup.com](http://www.mohawkgroup.com). Product:
    - a. C1: Learn and Live Side Stripe, No. GRT419.
  - 2. Shaw Contract, Cartersville, GA; 877-502-7429, [www.shawcontractgroup.com](http://www.shawcontractgroup.com).

3. Patcraft, Dalton, GA; 800-241-4014, [www.patcraft.com](http://www.patcraft.com).
4. Tarkett, Solon, OH; 800-248-2878, [www.tarkett.com](http://www.tarkett.com).
5. Interface, Atlanta, GA; 800-634-6032, [www.interface.com](http://www.interface.com).

B. Substitutions: Under provisions of Division 01.

## 2.2 MATERIALS

A. Carpet Tile (C1): Conforming to the following criteria:

1. Size: 24 inches by 24 inches.
2. Construction: Tufted
3. Surface Appearance: Textured Patterned Loop.
4. Fiber System: Duracolor Tricor Premium Nylon.
5. Dye Method: Solution Dyed.
6. Stain Release Technology: Permanent, Built into Fiber.
7. Soil Release Technology: EcoSentry Soil Protection.
8. Backing: Ecoflex One.
9. Pile Weight: 17 ounces per square yard.
10. Gauge: 1/12 inch.
11. Stitches per Inch: 12.4.
12. Pile Thickness: 0.080.
13. Density: 7650.
14. Total Recycled Content: 72.75 percent.
  - a. Pre-Consumer Recycled Content: 63.56 percent.
  - b. Post-Consumer Recycled Content: 9.19 percent.
15. Flammability: Class 1 (CRF: 0.45 watts per square centimeter or higher), per ASTM E648.
16. Smoke Density: NBS Smoke Density, less than 450 per ASTM E662.
17. Color: As indicated on Drawings.

## 2.3 ACCESSORIES

A. Sub-Floor Filler: Portland cement type as recommended by flooring material manufacturer.

1. Acceptable Manufacturers and Products:
  - a. UZIN UTZ North America, Inc., Aurora, GA; 720-374-4810, [us.uzin.com](http://us.uzin.com).
  - b. ARDEX Americas, Aliquippa, PA; 888-512-7339, [www.ardexamericas.com](http://www.ardexamericas.com). Product: Feather Finish.

B. Primers and Adhesives:

1. Primers: As recommended by carpet tile and adhesive manufacturer.
2. Adhesives: Water-resistant, mildew-resistant, non-staining, pressure-sensitive type to suit products and sub-floor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.

C. Resilient Wall Base and Transition Strips:

1. Molding Accessories: Rubber, unless otherwise indicated on Drawings. Provide where required or indicated.
  - a. Carpet edge or nosing.
  - b. Transition strips.
  - c. Reducer strip for resilient flooring.
2. Acceptable Manufacturers:
  - a. Tarkett, Solon, OH; 800-899-8916, [commercial.tarkett.com](http://commercial.tarkett.com).
  - b. Roppe Corporation, Fostoria, OH; 800-537-9527 [roppe.com](http://roppe.com).
  - c. Mannington, Calhoun, GA; 800-356-6787, [www.manningtoncommercial.com](http://www.manningtoncommercial.com).
  - d. Substitutions: Under provisions of Division 01.
3. Colors: As indicated on Drawings; if not indicated, as selected by Architect.

D. Metal Transition Strips:

1. Edge Trim: SCHIENE (E): Type 304 stainless steel edge trim as manufactured by Schlüter Systems, Plattsburgh, NY; 888-472-4588, [www.schluter.com](http://www.schluter.com) or accepted equal.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that substrate surfaces are smooth and flat with maximum variation of 3/16 inch in 10 feet and are ready to receive work.
- B. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for concrete relative humidity and alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.
- C. Contractor shall verify that concrete floors are dry and exhibit negative alkalinity, carbonization or dusting. The concrete relative humidity and alkalinity tests shall be performed per ASTM F2170 and ASTM D1308 respectively and shall be documented prior to installation of tile carpeting.
  1. Maximum Relative Humidity of Concrete: 75 percent.
  2. pH Range: 8-9.
- D. When concrete relative humidity and alkalinity test results exceed the values specified above, contact Architect for direction.
- E. Carpet tile shall not be installed when the atmospheric relative humidity exceeds 60 percent. Contractor shall provide dehumidifiers as required to maintain 60 percent maximum relative humidity for the duration of the carpet tile installation.
- F. Beginning of installation means acceptance of existing substrate and site conditions.

### 3.2 PREPARATION

- A. General: Comply with ASTM F710, CRI 104, and with carpet manufacturer's written installation instructions for preparing substrates.
- B. Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with sub-floor filler.
- C. Apply, trowel, and float filler to leave smooth, flat, hard surface. Repair all floor irregularities.
- D. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch, unless more stringent requirements are required by manufacturer's written installation instructions.
- E. Prohibit traffic until filler is cured.
- F. Broom and vacuum clean substrates to be covered immediately before installing carpet.
- G. When required by manufacturer, apply primer to concrete surfaces.
- H. Allow carpet to acclimate at installation location for at least 72 hours prior to beginning installation.

### 3.3 INSTALLATION

- A. Comply with CRI 104 and with carpet tile manufacturer's written installation instructions.
- B. Installation Pattern: Install modular tile using vertical ashlar technique; unless otherwise indicated on Drawings or recommended by carpet tile manufacturer.
- C. Installation Method: As recommended in writing by carpet tile manufacturer.
- D. Maintain dye lot integrity. Do not mix dye lots in the same area.
- E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on sub-floor. Use nonpermanent, non-staining marking device.
- H. Install pattern parallel to walls and borders, unless otherwise indicated on Drawings.
- I. Install edge strips at unprotected or exposed edges of carpet tile including terminations at thresholds and where carpet tile abuts a dissimilar finished floor material. Carpet tile edges and trim shall comply with CBC Section 11B-302.2 and Section 11B-303 requirements.

### 3.4 CLEANING

- A. Remove excess adhesive from floor, base and wall surfaces without damage. Remove and dispose of all scraps, cartons and rubbish upon completion of the work. Remove all loose yarn with sharp scissors.

- B. Clean carpet tiles of all spots with proper spot remover and vacuum clean carpet tile surfaces.

### 3.5 PROTECTION

- A. Prohibit traffic from carpet tile areas for 24 hours after installation. Installer shall take necessary steps to protect carpet tile work and the work of other trades during carpet tile installation and shall be responsible for restoration of work or property damaged by carpet tile installer.
- B. Protect installed carpet tile to comply with CRI 104, Section 16, Protection of Indoor Installations.
- C. Protect carpet tile from damage during construction operations for the remainder construction period. Cover carpet tile until Project Completion.

END OF SECTION



SECTION 09 81 00  
ACOUSTIC INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Acoustic insulation in interior wall construction.

1.2 RELATED SECTIONS

- A. Section 09 22 16 – Non-Structural Metal Framing.
- B. Section 09 29 00 – Gypsum Board.

1.3 REFERENCES

- A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.
- B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.
- C. Referenced Standards:
  - 1. ASTM C665 – Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
  - 2. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
  - 3. UL 723 – Standard Test Method for Surface Burning Characteristics of Building Materials.

1.4 SUBMITTALS

- A. Submit under provisions of Division 01.
- B. Product Data: Provide data on product characteristics, performance criteria, and limitations.
- C. Manufacturer's Certificate: Certify that products meet or exceed California Quality Standards.

1.5 SYSTEM DESCRIPTION

- A. Materials of this Section: Provide continuity of acoustic barriers and separations at building interior elements.

1.6 COORDINATION

- A. Coordinate work with other trades under provisions of Division 01.

## PART 2 PRODUCTS

### 2.1 GLASS FIBER BATT INSULATION

#### A. Acceptable Manufacturers:

1. Knauf Insulation, Inc., Shelbyville, IN; 317-398-4434, [www.knaufnorthamerica.com](http://www.knaufnorthamerica.com). Product: EcoBatt.
2. Owens Corning, Toledo, OH; 800-438-7465, [www.owenscorning.com](http://www.owenscorning.com).
3. CertainTeed, a Division of Saint-Gobain, Malvern, PA; 800-233-8990, [www.certainteed.com](http://www.certainteed.com).
4. Johns Manville, Denver, CO; 800-654-3103, [www.specJM.com](http://www.specJM.com).
5. Substitutions: Under provisions of Division 01.

#### B. Batt Insulation: ASTM C665 Type I; preformed glass fiber batt; conforming to the following:

1. Facing: Acoustic insulation shall be unfaced.
2. Flame Spread and Smoke Density Properties: 25/450 maximum in accordance with 2025 CBC Section 720, California Referenced Standard Code Chapter 12-13, ASTM E84 and UL 723.
3. Provide formaldehyde-free thermal insulation products.
4. Recycled Content: Minimum 20 percent post-consumer.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify existing site conditions.
- B. Verify that substrate, adjacent materials, and insulation are dry and ready to receive insulation.

### 3.2 INSTALLATION – BATT INSULATION

- A. Install insulation in accordance with insulation manufacturer's written installation instructions and with the flame spread rating and smoke density requirements of CBC Section 720, ASTM E84 and UL 723.
- B. Install in interior walls, full width, depth, and height of cavity, without gaps or voids. Do not compress insulation.
- C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- D. Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within the plane of insulation.
- E. Securely fasten and anchor insulation in place to prevent displacement or sagging of material in all areas.
  1. At metal stud walls, the insulation shall be wired in place with two #14 spring steel wires, one within 12 inches of the top and one at the mid-point of each stud bay.

END OF SECTION

## SECTION 09 91 00

### PAINTING

#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Surface preparation.
- B. Painting schedules, including painting of exposed interior surfaces.

##### 1.2 RELATED SECTIONS

- A. Section 08 11 13 – Hollow Metal Door Frames.
- B. Section 09 29 00 – Gypsum Board.

##### 1.3 REFERENCES

- A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.
- B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.
- C. Referenced Standards:
  - 1. ASTM D523 – Standard Test Method for Specular Gloss.

##### 1.4 SUBMITTALS

- A. Submit product data under provisions of Division 01.
- B. Provide product data on all painting products and accessories.
- C. Submit 4 brush-out samples 8 inches by 10 inches in size illustrating color and gloss level selected for each surface finishing product scheduled.
- D. During the Contract Closeout period, provide 2 copies of coating maintenance manual including, but not limited to, location of manufacturer's paint store closest to the project site, area summary with finish schedule, area detail designating where each product, color, and finish was used, product data sheets and material safety data sheets for each product used, color formulations for each color used, written cleaning instructions, touch-up procedures, and color samples of each color and finish used.

##### 1.5 QUALITY ASSURANCE

- A. Product Manufacturer: Company specializing in manufacturing quality paint and finish products with sufficient documented experience.
- B. Applicator: Company specializing in commercial painting and finishing with sufficient documented experience.

- C. Gloss Levels: Per Master Painters Institute (MPI) gloss standards MPI Gloss and Sheen Levels, measured in accordance with ASTM D523.

| GLOSS LEVEL | DESCRIPTION                                    | GLOSS AT 60 DEGREES<br>ASTM D523 | SHEEN AT 85 DEGREES<br>ASTM D523 |
|-------------|------------------------------------------------|----------------------------------|----------------------------------|
| G1          | A traditional matte finish – flat.             | 5 units, maximum                 | and 10 units, maximum            |
| G2          | A high side sheen flat - a velvet-like finish. | 10 units, maximum                | and 10 - 35 units                |
| G3          | A traditional eggshell-like finish.            | 10 - 25 units                    | and 10 - 35 units                |
| G4          | A satin-like finish.                           | 20 - 35 units                    | and 35 units, minimum            |
| G5          | A traditional semi-gloss.                      | 35 - 70 units                    | -                                |
| G6          | A traditional gloss.                           | 70 - 85 units                    | -                                |
| G7          | A high gloss.                                  | More than 85 units               | -                                |

- D. Previously Painted Surfaces Requiring Repainting: Surface preparation, priming, and paint application shall conform to applicable requirements of MPI Repainting Specification Manual.

## 1.6 REGULATORY REQUIREMENTS

- A. Conform to California Building Code for flame spread and smoke density requirements for finishes.
- B. Furnish certification that all paint coatings furnished for the location of the project comply with the EPA clean air act for permissible levels of volatile organic content for architectural coatings applied in California as designated by California Air Resources Board (CARB).

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in manufacturer's original unopened, labeled containers; inspect to verify acceptance.
- B. Store and protect products from abuse and contamination.
- C. Container labeling is to include manufacturer's name, type of paint, brand name, brand code, coverage, surface preparation, drying time, cleanup, color designation, and written instructions for mixing and reducing.
- D. Store paint materials at minimum ambient temperature of 50 degrees F and a maximum of 90 degrees F, in well-ventilated area, unless required otherwise by manufacturer's written installation instructions.
- E. Take precautionary measures to prevent fire hazards and spontaneous combustion.

## 1.8 ENVIRONMENTAL REQUIREMENTS

- A. Provide continuous ventilation and heating facilities to maintain surface and ambient temperatures above 50 degrees F for 24 hours before, during, and 48 hours after application of finishes, unless required otherwise by manufacturer's written installation instructions.
- B. Minimum Application Temperatures for Paints: 50 degrees F, unless required otherwise by manufacturer's written installation instructions.

C. Provide lighting level of 80 foot candles measured mid-height at substrate surface.

## 1.9 EXTRA MATERIALS

A. Provide a new and unopened one-gallon container of each type, color, and sheen to Owner.

B. Label each container with color, in addition to the manufacturer's label.

## PART 2 PRODUCTS

### 2.1 PAINT SYSTEMS, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

### 2.2 SUSTAINABLE DESIGN REQUIREMENTS

A. VOC Content of Field-Applied Paints and Coatings: Provide products that comply with the SCAQMD rule 1113 limits for VOC content.

### 2.3 ACCEPTABLE MANUFACTURERS – PAINT

A. Refer to Table at the end of this Section.

B. Substitutions: Under provisions of Division 01.

### 2.4 ACCEPTABLE MANUFACTURERS – PRIMER SEALERS

A. Refer to Table at the end of this Section.

B. Substitutions: Under provisions of Division 01.

### 2.5 MATERIALS

A. All paint materials shall be provided from a single manufacturer unless noted otherwise in this Section.

B. Coatings:

1. Ready mixed. Process pigments to a soft paste consistency capable of being readily and uniformly dispersed to a homogeneous coating.
2. Good flow and brushing properties; capable of drying or curing free of streaks or sags.

C. All field-applied interior paints shall use zero VOC colorants.

D. Accessory Materials: All other materials not specifically indicated but required to achieve the finishes specified, of commercial quality.

## 2.6 FINISHES

- A. Refer to schedule at end of Section for surface finish schedule. Refer to Drawings for color schedule.

## PART 3 EXECUTION

### 3.1 INSPECTION

- A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- C. 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: 18 percent.
- D. Beginning of application constitutes acceptance of existing surfaces.

### 3.2 PREPARATION

- A. Remove electrical plates, hardware, light fixture trim, and fittings prior to preparing surfaces for painting.
- B. Correct minor defects and clean surfaces that affect work of this Section.
- C. Seal marks that may bleed through surface finishes.
- D. Impervious Surfaces: Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- E. Gypsum Board Surfaces: Latex fill minor defects. Spot prime defects after repair.
- F. Shop-Primed Steel Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces as recommended by primer manufacturer. Prime shop-primed steel items with steel primers specified in this Section.
- G. Previously Painted Surfaces: Existing conditions vary. Evaluate degree of surface degradation. Surface preparation methods shall conform to applicable requirements of MPI Repainting Specification Manual.

### 3.3 PROTECTION

- A. Protect elements surrounding the work of this Section from damage or disfiguration.
- B. Repair damage to other surfaces caused by work of this Section.
- C. Furnish drop cloths, shields, and protective methods to prevent spray or droppings from disfiguring other surfaces.
- D. Remove empty paint containers from site.

### 3.4 APPLICATION

- A. Apply products in accordance with manufacturer's written installation instructions.
  - 1. Paint mil thicknesses shall not be less than the minimums recommended by the paint manufacturers.
- B. Do not apply finishes to surfaces that are not dry.
- C. Apply each coat to uniform finish.
- D. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.
- E. Sand lightly between coats to achieve required finish.
- F. Allow applied coat to dry before next coat is applied.
- G. All shop-primed items shall be fully re-primed in the field.

### 3.5 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

- A. Paint interior surfaces of air ducts and convector heating cabinets that are visible through grilles and louvers with 1 coat of flat black paint, to limit of sight line. Paint dampers exposed behind grilles to match face panels.
- B. Reinstall electrical plates, hardware, light fixture trim, and fittings removed for surface preparation or painting.
- C. Do not paint factory-finished mechanical and electrical equipment.

### 3.6 CLEANING

- A. As Work proceeds, promptly remove paint where spilled, splashed, or spattered.
- B. During progress of Work, maintain premises free of unnecessary accumulation of tools, equipment, surplus materials, and debris.
- C. Collect cotton waste, cloths, and material which may constitute a fire hazard, place in closed metal containers, and remove from site daily.

### 3.7 PAINTING SCHEDULE – INTERIOR SURFACES: Descriptions in schedule apply to new and previously painted surfaces, except surface preparation and priming of previously painted surfaces shall be in accordance with applicable requirements of MPI Repainting Specification Manual.

- A. Gypsum Board – Textured:
  - 1. 1st coat – PVA Flat Primer Sealer.
  - 2. Texture per Section 09 29 00.
  - 3. 2nd coat – PVA Flat Primer Sealer.
  - 4. 3rd and 4th coats – Acrylic Semi-Gloss Enamel.

- B. Gypsum Board – Textured:
1. 1st coat – PVA Flat Primer Sealer.
  2. Texture per Section 09 29 00.
  3. 2nd coat – PVA Flat Primer Sealer.
  4. 3rd and 4th coats – Acrylic Eggshell Enamel.
- C. Gypsum Board – Non-Textured:
1. 1st coat – PVA Flat Primer Sealer.
  2. 2nd and 3rd coats – Acrylic Semi-Gloss Enamel.
- D. Gypsum Board – Non-Textured:
1. 1st coat – PVA Flat Primer Sealer.
  2. 2nd and 3rd coats – Acrylic Eggshell Enamel.
- E. Ferrous Metal:
1. 1st coat – Acrylic Flat Primer.
  2. 2nd and 3rd coats – Acrylic Eggshell Enamel.
- F. Ferrous Metal – Typical paint system at hollow metal door frames:
1. 1st coat – Acrylic Flat Primer.
  2. 2nd and 3rd coats – Acrylic Semi-Gloss Enamel.

|                                |                                      |                       | MANUFACTURERS                  |                              |                  |                |
|--------------------------------|--------------------------------------|-----------------------|--------------------------------|------------------------------|------------------|----------------|
| APPLICATION                    | TYPE                                 | MPI<br>Gloss<br>Level | Dunn-<br>Edwards/<br>Carboline | Pittsburgh Paint Co./<br>PPG | Sherwin-Williams | Benjamin Moore |
| PRIMERS                        |                                      |                       |                                |                              |                  |                |
| Zero VOC Interior Gypsum Board | Acrylic                              | G1                    | VNSL00                         | 6-4900XI                     | B28 2600         | N534           |
| Interior Gypsum Board          | PVA                                  | G1                    | VNSL00                         | 6-2                          | B28 2600         | N534           |
| Interior Ferrous Metal         | Acrylic                              | G1                    | BRPR00                         | 90-1912                      | B66W01251        | HP1100         |
| FINISHES                       |                                      |                       |                                |                              |                  |                |
| Zero VOC Interior Gypsum Board | 100 percent Acrylic                  | G1                    | SZRO10                         | 6-70ZV                       | B30W02951        | 536            |
| Zero VOC Interior Gypsum Board | 100 percent Acrylic                  | G3                    | SWLL30                         | 6-411ZV                      | B20W01951        | 537            |
| Zero VOC Interior Gypsum Board | 100 percent Acrylic                  | G5                    | SWLL50                         | 6-500ZV                      | B31W01951        | 546            |
| Interior Gypsum Board          | 100 percent Acrylic                  | G3                    | SWLL30                         | 6-3511ZV                     | B20W01951        | 537            |
| Interior Gypsum Board          | 100 percent Acrylic                  | G5                    | SWLL50                         | 6-500ZV                      | B31W01951        | 546            |
| Interior Ferrous Metal         | 100 percent High Performance Acrylic | G3                    | ENCT30                         | 90-1710                      | B66W01251        | V342           |
| Interior Ferrous Metal         | 100 percent High Performance Acrylic | G5                    | ENCT50                         | 90-1610                      | B66W01151        | V341           |

END OF SECTION

## SECTION 10 14 00

### SIGNAGE

#### PART 1 GENERAL

##### 1.1 SECTION INCLUDES

- A. Interior signage:
  - 1. Accessibility signage.
  - 2. Occupancy load signage.
- B. Life safety signage.

##### 1.2 RELATED SECTIONS

- A. Section 09 29 00 – Gypsum Board.

##### 1.3 REFERENCES

- A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.
- B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.
- C. Referenced Standards:
  - 1. ASTM F593 – Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
  - 2. NFPA 101 – Life Safety Code.
  - 3. UL 924 – Emergency Lighting and Power Equipment.

##### 1.4 SUBMITTALS

- A. General: Submit in accordance with Division 01.
- B. Shop Drawings: Submit shop drawing for each sign and plaque to show construction, sections, text, character spacing, fonts, colors, and mounting details.
- C. Product Data: Submit product data for each product specified in this Section with the product and selected attributes clearly identified.
- D. Samples: Submit one full-size physical sample of each of the following sign types:
  - 1. Functional room sign demonstrating font, color, symbols, and braille characters.

##### 1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Firm specializing in manufacturing products specified in this Section with a minimum five years' experience.

B. Regulatory Requirements:

1. Accessibility Signage, General: Provide signage in accordance with California Code of Regulations, Title 24, Part 2, Chapter 11B, Sections 11B-216 and 11B-703, 2025 California Building Code.
  - a. Finish, Color, and Contrast: Characters, pictograms, symbols, and their backgrounds shall have a non-glare finish. Characters shall contrast with their background with either light characters on a dark background or dark characters on a light background.
  - b. Depth: Raised characters shall be 1/32 inch minimum above their background.
  - c. Case:
    - 1) Raised Characters: Characters shall be uppercase.
    - 2) Visual Characters: Characters shall be uppercase or lowercase or a combination of both.
  - d. Style: Characters shall be conventional in form. Characters shall not be italic, oblique, script, highly decorative, or of other unusual forms. Raised characters shall be sans serif.
  - e. Proportions:
    - 1) Raised characters on signs shall be selected from fonts where the width of the uppercase letter O is 60 percent minimum and 110 percent maximum of the height of the uppercase letter I. Stroke thickness of the uppercase letter I shall be 15 percent maximum of the height of the character.
    - 2) Visual characters on signs shall be selected from fonts where the width of the uppercase letter O is 60 percent minimum and 110 percent maximum of the height of the uppercase letter I.
  - f. Character Height:
    - 1) Raised Characters: Character height measured vertically from the baseline of the character shall be 5/8 inch minimum and 2 inch maximum based on the height of the uppercase letter I. Stroke thickness of tactile characters shall be 15 percent maximum of the height of the character.
    - 2) Visual Characters: Minimum character height shall comply with CBC Table 11B-703.5.5. Viewing distance shall be measured as the horizontal distance between the character and an obstruction preventing further approach towards the sign. Character height shall be based on the uppercase letter I.
  - g. Character Spacing:
    - 1) Raised Characters: Character spacing shall be measured between the 2 closest points of adjacent raised characters within a message, excluding word spaces. Where characters have rectangular cross sections, spacing between individual raised characters shall be 1/8 inch minimum and 4 times the raised character stroke width maximum, Where characters have other cross sections, spacing between individual raised characters shall be 1/16 inch minimum and 4 times the raised character stroke width maximum at the base of the cross sections, and 1/8 inch minimum and 4 times the raised character stroke width maximum at the top of the cross sections. Characters shall be separated from raised borders and decorative elements 3/8 inch minimum. Spacing between individual tactile characters shall comply with CBC Section 11B-703.2.7 and Section 11B-703.2.8.

- 2) Visual Characters: Character spacing shall be measured between the 2 closest points of adjacent characters, excluding word spaces. Spacing between individual characters shall be 10 percent minimum and 35 percent maximum of character height.
  - h. Line Spacing: Spacing between the baselines of separate lines of characters within a message shall be 135 percent minimum and 170 percent maximum of the character height.
  - i. Format: Text shall be in horizontal format.
  - j. Braille: Comply with CBC Section 11B-703.3, contracted Grade 2 Braille.
    - 1) Dimensions and Capitalization: Braille dots shall have a domed or rounded shape and shall comply with CBC Table 11B-703.3.1. The indication of an uppercase letter or letters shall only be used before the first word of sentences, proper nouns and names, individual letters of the alphabet, initials, and acronyms.
    - 2) Position: Braille shall be positioned below the corresponding text in a horizontal format, centered under text. If text is multi-lined, Braille shall be placed below the entire text. Braille shall be separated 3/8 inch minimum and 1/2 inch maximum from any other tactile characters and 3/8 inch minimum from raised borders and decorative elements.
  - k. Pictograms: Comply with CBC Section 11B-703.6.
    - 1) Pictogram Field: Pictograms shall have a field height of 6 inches minimum. Characters and Braille shall not be located in the pictogram field.
    - 2) Text Descriptors: Pictograms shall have text descriptors located directly below the pictogram field. Text descriptors shall comply with CBC Sections 11B-703.2, 11B-703.3, and 11B-703.4.
  - l. Symbols of Accessibility: Symbols of accessibility shall comply with CBC Section 11B-703.7.
  - m. Edges and verticals on geometric symbols shall comply with CBC Section 11B-703.7.2.6.4.
2. Accessibility Signage:
- a. Tactile Exit Signage: CBC Chapter 10 "Means of Egress," Section 1013 "Exit Signs," Section 1013.1 "Where Required," and Section 1013.4 "Raised Character and Braille Exit Signs".
    - 1) Tactile signs required by CBC Section 1013.4 need not be provided with illumination per Section 1013.3.
  - b. Other Accessible Signage: CBC Chapter 11B, "Accessibility to Public Buildings, Public Accommodations, Commercial Buildings and Public Housing."
    - 1) Assistive Listening Symbol: CBC Section 11B-216.10, "Assistive Listening Systems" and Section 11B-703.7.2.4, "Assistive Listening Systems". Assistive Listening System signs shall be provided at all assembly areas, including conference rooms and meeting rooms, as defined in CBC Chapter 2 and Chapter 11B.

- 2) Detailed Requirements for Accessible Signage: CBC Chapter 11B, Division 7, Section 11B-703, "Signs".
  - a) Sign Mounting Heights and Locations: CBC Sections 11B-703.4, 11B-703.5.6, and 11B-703.7.2.6.
  - b) Symbols of Accessibility: CBC Section 11B-703.7, "Symbols of Accessibility".
  - c) International Symbol of Accessibility: CBC Section 11B-703.7.2.1, "International Symbol of Accessibility".
- c. Field Inspection: Signs and identification shall be field inspected after installation and approved by the enforcing agency, in accordance with CBC Section 11B-703.1.1, "Plan Review and Inspection".
3. Exit Signage: Provide signage in accordance with California Code of Regulations, Title 24, Part 2, 2025 California Building Code, Chapter 10 "Means of Egress", Section 1013 "Exit Signs", as applicable to Occupancy Group.
  - a. Illuminated Exit Signs: CBC Section 1013.1 "Where Required", Section 1013.3 "Illumination", Section 1013.5 "Internally Illuminated Exit Signs", and Section 1013.6 "Externally Illuminated Exit Signs".

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Division 01.
- B. Deliver products in manufacturer's original packaging, dry and undamaged, with seals and labels intact.
- C. Storage and Protection: Store materials in a dry secure place. Protect from weather, surface contaminants, corrosion, construction traffic, and other potential damage.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
  1. WeidnerCA, Sacramento, CA; 800-561-7446, <https://weidnerca.com>.
  2. ASI Sign Systems, Inc., Irving, TX; 800-274-7732, [www.asisignage.com](http://www.asisignage.com).
  3. In Pro Corporation, Muskego, WI; 800-222-5556, [www.inprocorp.com](http://www.inprocorp.com).
  4. Mohawk Sign Systems, Schenectady, NY; 800-223-7705, [www.mohawksign.com](http://www.mohawksign.com).
  5. APCO Graphics, Inc., Atlanta, GA; 877-988-2726, [www.apcosigns.com](http://www.apcosigns.com).
  6. Diverse ID, Riverside, MO; 800-818-4540, [www.diverseid.com](http://www.diverseid.com).
- B. Substitutions: Under provisions of Division 01.

### 2.2 MATERIALS

- A. Acrylic Plastic: Non-glare finish acrylic with integral color as manufactured by Romark ([www.hansensupply.com](http://www.hansensupply.com)), CYRO Industries Acrylite FF ([www.acrylite.co](http://www.acrylite.co)) or accepted equal. Thickness shall be 1/8 inch minimum, unless noted otherwise. Colors as selected by Architect from manufacturer's full range of colors.

- B. Silk Screen Ink: Nazdar 9700 Series All Purpose Screen Ink as manufactured by Nazdar Ink Technologies ([www.nazdar.com](http://www.nazdar.com)) or accepted equal. Colors as selected by Architect.

## 2.3 INTERIOR SIGNAGE

- A. Accessible Signage: Provide the following signage in accordance with 2010 ADA Standards for Accessible Design and 2025 CBC where indicated on Drawings:
1. Material: Acrylic plastic, edges rounded, chamfered, or eased. Corners shall have minimum radius of 1/8 inch.
  2. Color: Characters, symbols, and pictograms on contrasting background per CBC Section 11B-703. Colors as selected by Architect from manufacturer's full range of colors.
  3. Functional Room Signage: Provide room signage with inlaid characters raised 1/32-inch, upper case, sans serif type with corresponding contracted Grade 2 Braille. Raised characters shall be at least 5/8 inch high, but no higher than 2 inches. Characters and symbols shall contrast with their background per CBC Section 11B-703.
  4. Assistive Listening Signage: Provide sign notifying availability of assistive listening system, 13 inch wide by 8 inch high acrylic plaque with international symbol of access for hearing loss in compliance with CBC Figure 11B-703.7.2.4 imprinted centered at the top of the sign and characters below with text ASSISTIVE LISTENING SYSTEM AVAILABLE AT ADMINISTRATION OFFICE.
  5. Tactile Exit Signage:
    - a. Provide tactile exit signs at doors in rooms or areas that require more than one exit or exit access per CBC Sections 1013.1 and 1013.4.
    - b. Acrylic plaque tactile exit signs shall have text at least 5/8 inch high, but no higher than 2 inch high, and corresponding contracted Grade 2 Braille shall be placed a minimum of 3/8 inch and a maximum of 1/2 inch directly below the text as follows:
      - 1) Each grade-level exterior exit door that is required to comply with CBC Section 1013.1 shall be identified by a tactile exit sign with the word EXIT.
      - 2) Each exit door that is required to comply with CBC Section 1013.1, and that leads directly to a grade-level exterior exit by means of an exit enclosure or an exit passageway shall be identified by a tactile exit sign with the words EXIT ROUTE.
      - 3) Each exit access door from an interior room or area to a corridor or hallway that is required to comply with CBC Section 1013.1 shall be identified by a tactile exit sign with the words EXIT ROUTE.
      - 4) Each exit door through a horizontal exit that is required to comply with CBC Section 1013.1 shall be identified by a tactile exit sign with the words TO EXIT.
- B. Occupancy Load Signs: Provide occupancy load sign. Text for sign MAXIMUM OCCUPANCY LOAD \_\_\_\_ BY ORDER OF THE STATE FIRE MARSHAL.
1. Blank Space Text: Coordinate text requirement for blank spaces with Architect prior to sign fabrication and installation.

## 2.4 LIFE SAFETY SIGNAGE

- A. Exit Signs: Internally illuminated exit signs conforming to NFPA 101, Section 7.10.7; UL listed in accordance with UL 924, with wording in legible characters not less than 4 inch high and text EXIT.

## 2.5 FABRICATION

- A. Work shall be fabricated in the shop, as far as practical, ready for installation at the site.
- B. Acrylic signs shall have inlaid acrylic copy/characters and Braille symbols as described in this Section.

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A. Install signs level and plumb.
- B. Accessible Sign Mounting Heights and Locations:
  - 1. Mounting Height with Tactile Characters: Per CBC Section 11B-703.4.1, tactile characters on signs shall be located 48 inches minimum above the finished floor or ground surface, measured from the baseline of the lowest Braille cells and 60 inches maximum above the finished floor or ground surface, measured from the baseline of the highest line of raised characters.
  - 2. Mounting Location with Tactile Characters: Per CBC Section 11B-703.4.2 as follows:
    - a. Where a tactile sign is provided at a door, the sign shall be located alongside the door at the latch side.
    - b. Where a tactile sign is provided at double doors with 1 active leaf, the sign shall be located on the inactive leaf.
    - c. Where a tactile sign is provided at double doors with 2 active leafs, the sign shall be located to the right of the right hand door.
    - d. Where there is no space at the latch side of a single door or at the right side of double doors, signs shall be located on the nearest adjacent wall.
    - e. Signs containing tactile characters shall be located so that a clear floor space of 18 inch minimum by 18 inch minimum, centered on the tactile characters, is provided beyond the arc of any door swing between the closed position and 45 degree open position.
    - f. Where permanent identification signage is provided for rooms and spaces, they shall be located on the approach side of the door as one enters the room or space. Signs that identify exits shall be located on the approach side of the door as one exits the room or space.
  - 3. Mounting Height with Visual Characters: Per CBC Section 11B-703.5.6, visual characters shall be 40 inches minimum above the finished floor or ground.
- C. Interior Functional Room Signs, Tactile Exit Signs, Assistive Listening Signs, and Occupancy Load Signs: Mount to door and wall surfaces with double faced adhesive foam tape strips applied vertically along the sides with silicone construction adhesive applied in between.
  - 1. Glass Mounted Signs: Apply acrylic sign to glass surfaces using double faced adhesive foam tape strips. Install same size, thickness, and color acrylic blank backer or sign of equal size on opposite side of exterior sign using double faced adhesive foam tape strips.

### 3.2 ADJUST AND CLEAN

- A. Clean and Touch-Up: Remove all packing and protection blemishes and thoroughly clean and polish all finish surfaces. Restore any marred or abraded surfaces to their original condition by touching up in accordance with the manufacturer's recommendations. Touch-up shall not be obvious.
- B. Defective Work: Remove and replace all defective work that cannot be properly repaired, cleaned or touched-up, as directed by the Architect, with no additional cost to the Owner.
- C. Protect installed work during the construction period to prevent abuse and damage.

### 3.3 CLEAN-UP

- A. Upon completion of the work of this Section, remove all surplus materials, rubbish, and debris from the premises.

END OF SECTION



SECTION 10 26 00  
WALL PROTECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Custom printed wall protection sheets.

1.2 RELATED SECTIONS

- A. Section 09 29 00 – Gypsum Board.

1.3 REFERENCES

- A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.
- B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.
- C. Referenced Standards:
  - 1. ASTM D543 – Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents.
  - 2. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
  - 3. ASTM F476 – Standard Test Methods for Security of Swinging Door Assemblies.

1.4 SUBMITTALS

- A. Submit under provisions of Division 01.
- B. Provide shop drawings showing layout, construction, mounting heights, and profiles.
- C. Product Data: Submit product data for each product specified in this Section with the product and selected attributes clearly identified.
- D. Samples:
  - 1. Custom Printed Wall Protection Sheets:
    - a. Provide paper proof of image and layout for review. When paper proof has been accepted, provide strike-off of image and layout on specified wall covering material.
    - b. Architect to select portion of full-size artwork for strike off.
- E. Submit manufacturer's written installation and maintenance instructions.

1.5 QUALITY ASSURANCE

- A. Provide non-PVC wall protection products.

## 1.6 REGULATORY REQUIREMENTS

- A. Requirements of California Building Code (CBC), 2025 Edition, Chapter 8, Interior Finishes apply.
- B. Products shall meet California Specification Section 01350 protocol for good indoor air quality.
- C. Wall protection systems shall meet Class A requirements in accordance with ASTM E84. Provide system components with UL label indicating the rating.

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Division 01.
- B. Deliver, store, and handle packaged materials in original containers with seals unbroken and labels intact until time of use.
- C. Unload materials carefully and store on clean concrete surface or raised platform in safe, dry area. Do not dump on ground.

## 1.8 WARRANTY

- A. Manufacturer's Limited Lifetime Systems Warranty for products that include all manufacturer recommended components and accessories related to wall protection products.

# PART 2 PRODUCTS

## 2.1 MANUFACTURERS

- A. Acceptable Manufacturers:
  - 1. Construction Specialties, Inc., Lebanon, NJ; 800-233-8493, [www.c-sgroup.com](http://www.c-sgroup.com).
  - 2. Pawling Corporation, Wassaic, NY; 800-431-3456, [www.pawling.com](http://www.pawling.com).
  - 3. InPro Corporation, Muskego, WI; 800-222-5556, [www.inprocorp.com](http://www.inprocorp.com).
  - 4. Koroseal Interior Products, LLC, Medina OH; 855-753-5474, <https://koroseal.com>.
- B. Substitutions: Under provisions of Division 01.

## 2.2 WALL PROTECTION SHEETS

- A. Interior Wall Surface Protection: Rigid, impact-resistant engineered PVC-free sheets, adhesively applied to gypsum board wall surfaces.
- B. Basis of Design Product: Acrovyn by Design, 0.040 inch thick rigid sheet.
- C. Materials and Properties:
  - 1. Impact-Resistant Rigid Sheet: Fire retardant, high-impact, rigid engineered PVC-free sheet.
  - 2. Profile: Minimum 0.040 inch thick PVC-free engineered, rigid, flat sheet.
  - 3. Dimensions: Nominal 4 feet wide by 8 feet high or 4 feet wide by 10 feet high, as applicable to design condition.
  - 4. Color: Clear.

5. Texture: Suede texture.
  6. Graphics: Custom digital images provided by Architect. Images shall be digitally printed on reverse side of clear sheet and sealed with a protective backer.
  7. Impact Resistance: Comply with ASTM F476 requirements.
  8. Chemical and Stain Resistance: Comply with ASTM D543 requirements.
  9. Anti-Bacterial.
  10. Fire-Resistive Rating: Class A, flame spread 25 or less, smoke developed 450 or less, in accordance with ASTM E84.
- D. Mounting: Mounting shall be by construction grade, water-based, VOC compliant primer and adhesive, supplied by wall protection sheet manufacturer.
- E. Mounting Height: As indicated on the Drawings.
- F. Trim: Provide manufacturer's vertical joint, wainscot, outside corner, and inside corner trim.
1. Color and material: As selected by Architect.
- G. Provide clear sealant at seams and corners of panels.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

- A. Examine areas to receive wall protection items and verify the following:
1. Dimensions of areas to receive wall protection items are accurate.
  2. Surfaces are clean, dry, reasonably smooth, and free from defects.
  3. Absence of other conditions that will adversely affect installation.
- B. Do not start work until unsatisfactory conditions have been corrected.

#### 3.2 PREPARATION

- A. Coordinate as required with installation of exposed finishes and other related work.
- B. New gypsum board shall be taped and sanded smooth. Completed surfaces shall be wiped clean to remove any dust.
- C. Surface Preparation:
1. Prepare surfaces to receive wall protection products per manufacturer's recommendations.
  2. Prior to installation, clean substrate to remove dirt, debris, and loose particles.

#### 3.3 INSTALLATION

- A. Install wall protection items in accordance with manufacturer's written installation instructions and accepted shop drawings.
- B. Prepare rigid sheet for application to wall surfaces. Apply rigid sheets to prepared wall surfaces with adhesive. Allow a 1/16-inch gap at adjoining door and window frames, ceilings, and wall base. Install trim per manufacturer's recommendations.

1. Where clear sealant is used at panel seams, field paint substrate a minimum of 6 inches on either side of seam under provisions of Section 09 91 00. Color as selected by Architect to match graphic background.

C. Install items plumb, true, rigid, and neatly trimmed out.

#### 3.4 CLEANING AND PROTECTION

A. Comply with requirements of Division 01.

B. Immediately upon completion of installation, clean products in accordance with manufacturer's recommended cleaning method.

C. Protect work from damage to surface, profile, and shape.

D. Completely remove protective covering from wall protection items prior to final project acceptance.

E. Replace damaged items at no cost to Owner.

END OF SECTION

SECTION 23 05 10  
MECHANICAL GENERAL PROVISIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. References.
- B. Description of Work.
- C. Drawings and Specifications.
- D. Industry Standards and Codes.
- E. Site Examination.
- F. Permits, Fees and Utility Connections.
- G. Coordination of Work.
- H. Progress of Work.
- I. Submittals
- J. Operation and Maintenance Manuals.
- K. Project Record Documents.
- L. Warranty.
- M. Quality and Care
- N. Access Doors.
- O. Starting Equipment and Systems.

1.2 RELATED SECTIONS

- A. The Drawings and General Provisions of the Contract, including the General Conditions, Special Conditions and Division 1 General Requirements apply to this section.
- B. The Contract Agreement, Bidding Documents and all Addenda issued prior to Contract Agreement execution form a part of these specifications and apply to all Contracts or Subcontracts relating to the mechanical systems.
- C. The requirements of this Section apply to all Work of Division 23.

1.3 REFERENCES

- A. ANSI - American National Standards Institute.
- B. ASTM - American Society for Testing Materials.
- C. CEC - California Electric Code.
- D. NEMA - National Electric Manufacturers' Association.
- E. NFPA - National Fire Protection Association.
- F. OSHA - Occupational Safety and Health Act.
- G. UL - Underwriters' Laboratories.
- H. See detailed References that are listed in individual sections.

#### 1.4 DESCRIPTION OF WORK

- A. The work included in this division of the specifications consists of furnishing labor, tools, equipment, supplies and materials, unless otherwise specified, and in performing operations necessary for the installation of the complete Mechanical System as required by these specifications or shown on the Drawings, subject to the terms and conditions of the Contract Agreement.
- B. The work shall also include the completion of details of mechanical work not mentioned or shown which are necessary for the successful operation of mechanical systems described on the drawings or required by these specifications. Furnish and install any incidental work not shown or specified which is required to provide a complete and operational system.

#### 1.5 DRAWINGS AND SPECIFICATIONS

- A. Drawings are schematic and diagrammatic. Drawings indicate the general arrangement of equipment, piping, ductwork and other mechanical work. Use judgement and care to install mechanical work to fit the job conditions within the building construction and finishes, and to function properly.
- B. The Contractor shall investigate the building conditions affecting the Work and shall arrange his work accordingly providing offsets, fittings, valves and accessories to fit the actual job conditions. The Contractor shall be responsible to field measure and confirm new and existing mechanical systems locations with respect to other architectural, structural, and electrical work, existing and new. Do not scale distances off of the mechanical drawings. Use actual building dimensions.
- C. The drawings and specifications are complimentary each to the other. What is required by one shall be as binding as if called for by both.

- D. Examine all drawings and specifications prior to bidding the Work. Report any discrepancies to the Engineer.

#### 1.6 INDUSTRY STANDARDS AND CODES

- A. The Mechanical Contractor shall comply with the latest provisions of all codes, regulations, laws and ordinances applicable to the work involved. This does not relieve the Contractor from furnishing and installing work shown or specified which may exceed the requirements of such codes, regulations laws and ordinances.

- B. All materials, products, devices, fixtures forms or types of construction included in this project shall meet or exceed the published requirements of the publications listed below. These publications form a part of this specification.

1. California Building Code, 2025.
2. California Mechanical Code, 2025.
3. California Plumbing Code, 2025.
4. California Electrical Code, 2025.
5. National Fire Protection Association.
6. California Fire Code, 2025.
7. California State Fire Marshal.
8. Occupational Safety and Health Administration, including CAL-OSHA.
9. California Energy Code, 2025.
10. California Green Building Standards Code, 2025.
11. State of California Code of Regulations, Title 24.
12. Other applicable state laws.

- C. Nothing in the Drawings or Specifications shall be construed to permit work that does not conform these codes. When Contract Documents differ from governing codes, furnish and install to the higher standard required at no extra charge. The Contract Documents are not intended to repeat the code requirements except where necessary for clarity.

- D. No material or product installed as a part of the Work shall contain asbestos in any form.

#### 1.7 SITE EXAMINATION

- A. Contractor shall examine the site, verify dimensions and locations with Drawings, check utility connection locations, and familiarize himself with the existing conditions and limitations. No extras will be allowed because of the Contractor's misunderstanding of the amount of work involved or his lack of knowledge of any site condition which may affect his work. Any apparent variance of the drawings or specifications from the existing conditions at the site shall be called to the attention of the Engineer immediately.

#### 1.8 PERMITS, FEES AND UTILITY SERVICES

- A. Contractor shall pay for and obtain all permits and service required in the installation of this work.
- B. Contractor shall arrange for all required inspections and will secure approvals from authorities having jurisdiction.

#### 1.9 COORDINATION OF WORK

- A. It is recognized that the contract documents are diagrammatic in showing certain physical relationships which must be established within the mechanical work, and in its interface with other work and that such establishment is the exclusive responsibility of the contractor.
- B. The Contractor shall give careful consideration to the work of the General, Electrical and other contractors on the job and shall organize his work so that it will not interfere with the work of other trades. He shall consult the drawings and specifications for work of other trades for correcting information, and the pertinent drawings for details and dimensions.
- C. Arrange mechanical work in a neat, well-organized manner with the piping, conduit, and similar services running parallel and/or perpendicular to primary lines of the building construction. Locate operating and control equipment properly to provide easy access, and arrange entire mechanical work with adequate access for operation and maintenance.
- D. Verify the location of all equipment, and devices, etc. and if interference develops, the Owner/Engineer's decision will be final and no additional compensation will be allowed for the moving of misplaced air devices or equipment.

#### 1.10 PROGRESS OF WORK

- A. This Contractor shall organize his work so that the progress of the mechanical work will conform to the progress of the other trades, and shall

complete the entire installation as soon as the conditions of the building will permit. Any cost resulting from defective or ill timed work performed under this section shall be borne by this Contractor.

#### 1.11 STRUCTURAL DESIGN REQUIREMENTS AND SEISMIC RESTRAINTS

- A. Mechanical systems and equipment shall be anchored and seismically braced in accordance with all applicable codes and industry standards.
- B. Mechanical systems and equipment shall include, but are not limited to, all piping, heating and ventilating equipment, electrical and control panels, conduits and other components.
- C. For all non-standard installations not detailed in one of the approved systems, the Contractor shall provide details of supports, anchorages and restraints, including attachments to building structure, with supporting calculations all stamped and signed by a licensed professional structural engineer registered in the state in which the Work is performed.

#### 1.12 SUBMITTALS

- A. See Division 1 for additional submittal procedures.
- B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- C. Shop Drawing Submittals: Prepared specifically for this Project.
- D. Organize submittals in sequence according to Specification Section. Submit in bound document with tabs identifying each Specification Section. Provide a Table of Contents identifying the Specifications Sections being submitted and the contents within each tabbed section. Prepare Submittals in multiple volumes if required. Provide a complete Submittal package at one time. Do not submit individual Sections piecemeal.
- E. Indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- F. Furnish, upon request, installation instructions for all equipment and materials to Inspector of Record prior to installation.
- G. Maintain a copy of the fire and smoke damper installation instructions on site for use by the Inspector of Record.

#### 1.13 SUBSTITUTION PROCEDURES

- A. Instructions to Bidders specify time restrictions for submitting requests for substitutions during the bidding period. Comply with requirements specified in this section.
- B. LP Consulting Engineers, Inc. will consider requests for substitutions only within 7 days after date of Agreement.
- C. Substitutions may be considered when a product becomes unavailable through no fault of the .
- D. Failure by the Contractor to order materials or equipment in a timely manner will not constitute justification for a substitution.
- E. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.
- F. A request for substitution constitutes a representation that the submitter:
  - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
  - 2. Will provide the same warranty for the substitution as for the specified product.
  - 3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
  - 4. Waives claims for additional costs or time extension which may subsequently become apparent.
  - 5. Will reimburse Owner and LP Consulting Engineers, Inc. for review or redesign services associated with reapproval by authorities including obtaining reapproval by authorities.
- G. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.
- H. If excessive review, as judged by the Engineer, is required caused by complicated, numerous or repetitive requests, Contractor shall reimburse Engineer and its Consultants for such review at their standard billing rates.
- I. Substitution Submittal Procedure:

1. Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.
2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
3. The LP Consulting Engineers, Inc. will notify in writing of decision to accept or reject request.
4. Present each substitution individually. If a proposed substitute is not found to be acceptable, then the specified item shall be supplied.

#### 1.14 OPERATION AND MAINTENANCE MANUALS

- A. See Division 1 for Closeout Submittals for Operation and Maintenance Manual requirements.
- B. Provide operating and maintenance instructions, diagrams and parts lists for all components of all mechanical systems and each piece of equipment furnished under these specifications.
- C. Operating and maintenance instructions shall be furnished for the following equipment and systems:
  1. Ventilating Systems.
  2. Air Conditioning Systems.
  3. Piping Systems.
  4. Temperature Controls Systems.
  5. Motors.
  6. Testing, Adjusting, and Balancing Reports.
- D. Provide manufacturer's model number, design data, capacities, etc. for each piece of mechanical equipment furnished as a part of the Work.
- E. The operating instructions shall include procedures for starting, stopping and emergency manual operation for all equipment and systems.
- F. Provide maintenance instructions of each item of individual equipment including applicable maintenance data as recommended by the manufacturer, including frequency of lubrication, lubricants, inspections required, adjustment procedures, belt and pulley sizes, etc.

- G. Provide manufacturer's parts bulletins with part numbers for each item of equipment included in the Work. Parts bulletins shall be specific to the equipment provided. Extraneous information that does not apply to the equipment provided shall be eliminated from the literature.
- H. Include copies of test reports (startup, check, etc.) and inspections performed for each piece of equipment provided in the Work.
- I. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- J. Provide supplier and manufacturer contacts, telephone numbers and addresses in the front portion of the operation and maintenance manual.

#### 1.15 PROJECT RECORD DOCUMENTS

- A. See Division 1 for Closeout Procedures.
- B. Provide red-lined drawings accurately showing location of equipment and devices and size and routing of ductwork. Include notes explaining installed condition for complete understanding.

#### 1.16 QUALITY ASSURANCE

- 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 LP Consulting Engineers, Inc. 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.

#### 1.17 PROJECT CONDITIONS

- A. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

#### 1.18 WARRANTY

- A. See Division 1 for additional warranty requirements.
- B. Correct defective Work within a one year period after Date of Substantial Completion.

### PART 2 PRODUCTS

#### 2.1 QUALITY AND CARE

- A. All materials shall be new and in perfect condition when installed unless specifically indicated otherwise. Materials shall be tested within the Continental United States by an independent, nationally recognized testing agency and shall be listed in accordance with testing agency requirements. When not otherwise specified, all material shall conform to applicable National Standards (ANSI).
- B. All capacities, sizes and efficiency ratings shown on the drawing are minimum.
- C. Each category of material or equipment shall be of the same brand or manufacturer throughout the Work wherever possible.
- D. The quality of materials and equipment to be provided is defined by the brand names, manufacturers, model and catalog numbers listed on the Drawings and in the Specifications. Contractor shall provide each item listed, of the quality specified, or equal.
- E. Deliver, store, protect, and handle products in conformance with manufacturer's recommended practices as outlined in applicable Installation and Maintenance Manuals.
- F. Inspect and report concealed damage to carrier within their required time period.
- G. Store materials in a clean, dry space. Maintain factory protection and/or provide an additional heavy canvas or heavy plastic cover to protect from dirt, water, construction debris, and traffic.
- H. Equipment which has been damaged, exposed to weather or is, in the opinion of the Engineer or Owner, otherwise unsuitable because of improper fabrication, storage or installation shall be removed and replaced by this Contractor at his expense.

## 2.2 ACCESS DOORS

- A. Coordinate access door requirements with Division 1. The more stringent requirements shall govern.
- B. Provide access doors where access through floors, walls or ceilings is required to access mechanical, plumbing, control system components, fire dampers and fire alarm system components (such as smoke detectors, fire/smoke dampers, etc.) or other systems requiring access for maintenance, test or observation.
  - 1. Access doors requiring hand access or access for observation only shall be 14"x14" minimum usable opening.
  - 2. Access doors where entrance of a service person may be required shall be 24"x30" minimum usable opening.
- C. Established standard: Milcor of types listed below. Other acceptable manufacturers: CESCO, J.L. Industries, Karp, Larsen's, or equal. Comply with the following:
  - 1. Form doors and frames of welded, ground smooth steel construction, 14 gauge for doors, 16 gauge for frames. Provide prime coat finish except for stainless steel type.
  - 2. Concealed hinges to allow 175 degree opening.
  - 3. Locks: flush, screw driver operated cam lock(s).
  - 4. Provide anchoring devices suitable for the construction into which the doors are framed.
- D. Application (as applicable):
  - 1. In gypsum drywall walls and ceilings: Type DW.
  - 2. In ceramic tile walls: Type MS (stainless steel).
  - 3. In fire rated walls: Type Fire Rated (rating as required for wall or ceiling), self closing, 250 F in 30 min. temperature rating.

## PART 3 EXECUTION

### 3.1 INSTALLATION

- A. Access Doors

1. Coordinate the exact location of access doors to provide proper access to the item concealed. Obtain written approval for access door locations from Architect.
2. Coordinate installation of access doors with the trades performing the construction assemblies into which the access doors are placed.
3. Install all access doors neatly and securely, to open and close completely, and to operate freely and without binding. Install rated doors in accordance with their listing requirements.
4. Test operate all doors and make all adjustments required for satisfactory operation. Replace all damaged materials.
5. Install in accordance with manufacturer's instructions.

### 3.2 FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance with the requirements within this section.
- B. Test all piping with no leak or loss in pressure in accordance with the requirements within this section.

### 3.3 GENERAL TESTING REQUIREMENTS FOR MECHANICAL AND PLUMBING SYSTEMS

- A. Contractor shall assign a responsible person to be an independent representative to witness testing and to sign as witness of times, pressure and losses of testing media for all hydronic piping and duct testing.
  1. Test all piping as noted below with no leak or loss of pressure. Repair or replace defective piping until tests are accomplished successfully.
  2. Submit to the Engineer for review a log of all tests made which shall include time, temperature, pressure, water makeup and other applicable readings, necessary to indicate the systems have been operated and tested in the manner outlined in the construction documents.
  3. After producing the specified test pressure, disconnect the pressurizing source; do not introduce further pressure for the duration of the test period, repair leaky piping and retest. Repeat the procedure until the entire system is proven tight.
- B. Test the following systems with the medium listed to the pressure indicated for the time period listed:

1. Hydronic Piping: Pressure=125 Psig / Medium= Water / Duration=4 Hours.

### 3.4 CUTTING AND PATCHING

- A. Submit written request in advance of cutting or alteration which affects:
  1. Structural integrity of any element of Project.
  2. Integrity of weather exposed or moisture resistant element.
  3. Efficiency, maintenance, or safety of any operational element.
  4. Visual qualities of sight exposed elements.
  5. Work of Owner or separate Contractor.
- B. Execute cutting and patching to complete the work, to uncover work to install improperly sequenced work, to remove and replace defective or non-conforming work, to remove samples of installed work for testing when requested, to provide openings in the work for penetration of mechanical and electrical work, to execute patching to complement adjacent work, and to fit Products together to integrate with other work.
- C. Execute work by methods to avoid damage to other work, and which will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
- D. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- E. Restore work with new Products in accordance with requirements of Contract Documents.
- F. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- G. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Code requirements, to full thickness of the penetrated element.
- H. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

### 3.5 PRIMING AND PAINTING

- A. Apply primer to all exposed ferrous metals that are not factory primed, factory finished, galvanized, stainless steel or anodized. Exposed black steel piping shall be primed and finish painted to match Architectural finish requirements.
  - 1. Primer shall be as recommended by the paint manufacturer for each specific application.
  - 2. Acceptable Products include: Fuller O'Brien Blox-Rust Metal All Purpose Primer, equivalent Rust-Oleum product, or equal. See Section 092216 for other acceptable products.
- B. Apply two coats of primer to metal surfaces of items to be insulated or jacketed, except ductwork and piping, or factory primed or finished.
- C. Preparation:
  - 1. Do not start work until surfaces to be finished are in proper condition to produce finished surfaces of uniform, satisfactory appearance.
  - 2. Stains and Marks: Remove completely, if possible, using materials and methods recommended by coating manufacturer; seal stains and marks which cannot be completely removed using Devco KILSTAIN primers, shellac, or other coating acceptable to paint manufacturer any marks or defects that might bleed through paint finishes.
  - 3. Remove mildew from impervious surfaces by scrubbing with solution of trisodium phosphate and bleach. Rinse with clean water and allow substrate to thoroughly dry.
  - 4. Galvanized Surfaces:
    - a. Remove surface contamination and oils by solvent cleaning in accordance with SSPC-SP 1 and allow to dry.
    - b. Apply Devco MIRROLAC Galvanized Metal Primer in accordance with manufacturer instructions.
  - 5. Uncoated Steel And Iron Surfaces:
    - a. Remove grease, rust, scale, and dust from steel and iron surfaces using solvent in accordance with SSPC-SP 1.
    - b. Where heavy coatings of scale or contaminants are evident, hand tool clean in accordance with SSPC-SP 2 or use other approved SSPC SP method as needed.

6. Shop Primed Steel Surfaces: Remove loose primer and dust. Sand and feather edges to smooth surface. Clean areas with solvent and spot prime bare metal surfaces with appropriate Devco MIRROLAC metal primer or primer recommended by manufacturer.

D. Application:

1. Apply each coat to uniform coating thickness in accordance with manufacturer's instructions, not exceeding manufacturer's specified maximum spread rate for indicated surface; thins, brush marks, roller marks, orange-peel, or other application imperfections are not permitted.
2. Allow manufacturer's specified drying time, and ensure correct coating adhesion, for each coat before applying next coat.
3. Remove dust and other foreign materials from substrate immediately prior to applying each coat.

3.6 STARTING EQUIPMENT AND SYSTEMS/COMMISSIONING

- A. Start equipment and systems in accordance with manufacturer's written instructions..
- B. Adjust for proper operation within manufacturer's published tolerances.
- C. Demonstrate proper operation of equipment to Owner's designated representative.

D. Description:

1. Comply with all start up of mechanical and electrical equipment systems as required in the various sections and herein.
2. Coordinate all testing and startup procedures with all other trades so that all non-mechanical and non-electrical work is completed and operational so that the specified testing can be performed.

E. Preliminary Work:

1. Prior to the startup, the Contractor shall ensure that the systems are ready to operate, and the following items have been completed and checked including but not limited to:
  - a. Proper motor and pump rotation.
  - b. Flushing and cleaning of the system.
  - c. Wiring

- d. Auxiliary connections
  - e. Lubrication.
  - f. Venting.
  - g. Controls.
  - h. Installation of filters and strainers.
  - i. Setting of relief and safety valves .
- 2. All electrical testing must be completed and test results submitted before equipment startup to avoid power interruptions during mechanical equipment startup and testing.
  - 3. The Contractor shall submit at least 10 days in advance a schedule listing the date of completion of his work as it will be ready for equipment startup of Electrical/Mechanical equipment. This schedule shall include work on a system by system, floor by floor basis.
  - 4. Two weeks prior to the startup of any major equipment, the Contractor shall certify in writing that the systems will be complete and ready for startup. Completeness shall not only include physical installation of individual pieces of equipment, but all related elements of other crafts to make all equipment operate as a system.
    - a. The startup checklist will cover all related crafts, e.g., controls, electrical, mechanical, and a clean environment for equipment startup.
  - 5. The Contractor shall schedule a tour with the Owner's representative and the Engineer to review startup conditions prior to equipment startup. This tour shall take place during the associated Engineer's regularly scheduled visit. This tour does not relieve the Contractor of any responsibilities to properly start equipment. The Engineer will issue a notice of deficiencies that will be required to be corrected prior to equipment startup. The Contractor will be required to reschedule a back check with the Engineer prior to attempting an equipment startup.
  - 6. Equipment of systems should not be started until systems and associated subsystems are completed. Verify that other continuing work could not possibly damage completed systems if they are in operation. Furnish signed off prestartup check sheet.
- F. Startup and Commissioning:
- 1. System Startup and Operation:

- a. The Contractor shall provide all labor, materials and services necessary for the initial startup and operation of all systems and equipment furnished and installed under this section.
- b. The Contractor and the factory representative shall check all equipment during initial startup to insure correct rotation, proper lubrication, adequate fluids or air flows, nonoverloading electrical characteristics, proper alignment and vibration isolation. Systems shall be checked for air and/or water flows throughout without blockages. Air handling systems shall be checked for proper damper connections and positions, aligned and adjusted belt drives, proper lubrication, temporary air filters installed, nonexcessive electrical characteristics and minimal vibration. Other miscellaneous equipment shall be started and operated as described above as applicable. Manufacturer's representative shall submit a preliminary written copy of equipment startup check sheet prior to leaving job site.
- c. After initial startup and operation of systems, the Contractor shall submit a report, showing proper operation before commencement of the final "Operation Test".
- d. During initial operation of the system and until substantial completion, qualified personnel shall be provided and designated for maintaining the equipment and systems in good running order. Items such as strainers, cleanouts, filter replacement, bearing lubrication, packing replacement, and other consumables shall be provided without cost to the Owner. Failure of equipment during this period due to lack of proper supervision is the responsibility of the Contractor and continued failures shall be grounds for the Owner to provide such services with back charges to the Contractor. Submit written schedule of completed maintenance to the Engineer.

G. System Acceptance:

1. General: The system installation shall be complete and tested for proper operation prior to acceptance testing "Operation Test" for the Owners authorized representative. A letter shall be submitted to the Engineer requesting system acceptance. This letter shall certify that all controls are installed and the software programs have been completely exercised for proper equipment operation. Acceptance testing shall commence at a mutually agreeable time within ten (10) calendar days of request. When the field test procedures have been demonstrated to the Owner's representative and pass, the system will be accepted. The warranty period may begin at this time.

2. A certified acceptance test technician (ATT) shall perform and document acceptance testing as applicable per Title 24 sections 120.5 and 130.4. Certificate of Acceptance shall be in PDF format for electronic submission to Authority Having Jurisdiction.

H. Operation Test:

1. Provide all labor, equipment, and materials required to perform test.
2. The test shall occur after all major equipment startup and balance services have been performed as specified. The purpose is to demonstrate that individual pieces of equipment and all related elements operate as one complete system and not to identify incomplete or defective work.
3. All equipment is to be run in an automatic operating position and exercised for 72 hours to verify that they perform in accordance with the specified sequence of operation and designed operation logic.
4. The Engineer's representative shall be notified and may be present for the initiation of the test.
5. A log shall be prepared by the Contractor, to be submitted to the Engineer, of all tests including, but not limited to: time, temperatures, pressures, and other readings to prove all equipment is operating as specified.
6. All temperatures, pressures, status indication, etc., shall be verified by at least one other means of measurement or visual verification of condition.
7. Change set points and simulate conditions as directed to demonstrate:
  - a. Ability to control to new set point.
  - b. Interface between systems, fire alarm/fire sprinkler systems.
  - c. Proper sequence and operation.
  - d. Equipment safety systems and all automatic changeover/backup systems and alarms are functioning or will function.
8. If unsatisfactory performance or a system failure is experienced for any reason, the test shall be repeated until 72 hour consecutive hours are achieved. The Engineer's representative shall make all final decisions of a satisfactory test.

END OF SECTION



SECTION 23 05 29  
HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Strut systems for pipe or equipment support.
- B. Beam clamps.
- C. Pipe hangers.
- D. Pipe rollers and roller supports.
- E. Pipe supports, guides, shields, and saddles.
- F. Seismic bracing hardware.
- G. Nonpenetrating rooftop supports for low-slope roofs.
- H. Anchors and fasteners.

1.2 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- C. ASTM A181/A181M - Standard Specification for Carbon Steel Forgings, for General-Purpose Piping; 2023.
- D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
- E. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).
- F. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.
- G. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures; 1999 (Reapproved 2022).

- H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.
- 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; 2023.
- J. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.
- K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- L. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.
- M. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).
- N. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- O. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

### 1.3 SUBMITTALS

- A. See Division 1 specifications for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, nonpenetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.
- C. Evaluation Reports: For products specified as requiring evaluation and recognition by ICC Evaluation Service, LLC (ICC-ES), provide current ICC-ES evaluation reports upon request.

## PART 2 PRODUCTS

### 2.1 GENERAL REQUIREMENTS

- A. Provide required hardware to hang or support piping, equipment, or fixtures with related accessories as necessary to complete installation of mechanical work.

- B. Provide hardware products listed, classified, and labeled as suitable for intended purpose.
- C. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
- D. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
- E. Fire Resistance: Provide hardware rated for 120 minutes resistance unless specifically indicated by the authority having jurisdiction.
- F. Materials for Metal Fabricated Supports:
  - 1. Galvanized Steel: Hot-dip galvanized in accordance with ASTM A123/A123M or ASTM A153/A153M unless stated otherwise.
- G. Corrosion Resistance: Use corrosion-resistant metal-based materials fully compatible with exposed piping materials and suitable for the environment where installed.
  - 1. Indoor Dry Locations: Use approved equivalent or galvanized steel unless otherwise indicated.
  - 2. Outdoor, Damp, or Wet-Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.

## 2.2 STRUT SYSTEMS FOR PIPE OR EQUIPMENT SUPPORT

- A. Strut Channels:
  - 1. ASTM A653/A653M galvanized steel bracket with clamps for surface mounting of piping or plumbing equipment support.
  - 2. Channel or Bracket Kits: Include rods, brackets, end-fixed fittings, covers, clips, and other related hardware required to complete sectional trapeze section for piping or other support.
- B. Hanger Rods:
  - 1. Threaded zinc-plated steel unless otherwise indicated.
  - 2. Minimum Size, Unless Otherwise Indicated or Required:
    - a. Equipment Supports: 3/8 inch diameter.

- b. Piping up to 4 inch: 3/8 inch diameter.
- c. Piping larger than 4 inch: 1/2 inch diameter.
- d. Trapeze Support for Multiple Pipes: 3/8 inch in length.

C. Channel Nuts:

- 1. Provide carbon steel channel nut with epoxy copper or zinc finish and long, regular, or short spring as indicated on drawings.

2.3 BEAM CLAMPS

- A. MSS SP-58 types 19 through 23, 25 or 27 through 30 based on required load.
- B. Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.
- C. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.

2.4 PIPE HANGERS

A. J-Hangers, Adjustable:

- 1. MSS SP-58 type 5, zinc-plated ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.
- 2. Felt-Lined: Provide for uninsulated pipe to reduce noise and prevent static issues.

B. Swivel Ring Hangers, Adjustable:

- 1. MSS SP-58 type 10, epoxy-painted, zinc-colored.
- 2. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
- 3. Felt-Lined: Provide for uninsulated pipe to reduce noise and prevent static issues.

C. Clevis Hangers, Adjustable:

- 1. Copper Tube: MSS SP-58 type 1, epoxy-plated copper.

2. Felt-Lined: MSS SP-58 type 1, zinc-plated, silicone-free carbon steel.
3. Light-Duty: MSS SP-58 type 1, zinc-colored, epoxy plated.
4. Standard-Duty: MSS SP-58 type 1, zinc-colored, epoxy plated.

## 2.5 PIPE CLAMPS

### A. Riser Clamps:

1. For insulated pipe runs, provide two bolt-type clamps designed for installation under insulation.
2. MSS SP-58 type 1 or 8, carbon steel or steel with epoxy plated, plain, stainless steel, or zinc plated finish.
3. Medium Split Horizontal Pipe Clamp: MSS SP-58 type 4, carbon steel or stainless steel with epoxy plated, plain, stainless steel, or zinc plated finish.
4. Copper Tube Pipe Clamp: MSS SP-58 type 8, epoxy plated copper.

### B. Extension Split Pipe Clamp:

1. MSS SP-58 type 12, hinged split ring and yoke roller hanger with epoxy copper or plain finish.
2. Material: ASTM A47/A47M malleable iron or ASTM A36/A36M carbon steel.
3. Provide hanger rod and nuts of the same type and material for a given pipe run.
4. Provide coated or plated hangers to isolate steel hangers from dissimilar metal tube or pipe.

### C. Offset Pipe Clamps: Double-leg design two-piece pipe clamp.

### D. Strut Clamps:

1. Pipe Clamp: Two-piece rigid, universal, or outer diameter type, carbon steel with epoxy copper or zinc finish.
2. Cushioned Pipe or Tubing Strut Clamp: Provide strut clamp with thermoplastic elastomer cushion having dielectric strength of 670 V/mil.

### E. Insulation Coupling:

1. Two bolt-type clamps designed for installation under insulation.
2. Material: Carbon steel with epoxy copper or zinc finish.

## 2.6 PIPE ROLLERS AND ROLLER SUPPORTS

- A. MSS SP-58 type 43 based on required load, nonconductive and corrosion resistant.
- B. Steel Yoke Type: MSS SP-58 type 44, vertically adjustable, nonconductive, and corrosion resistant.
- C. Material: Zinc plated ASTM A36/A36M carbon steel or ASTM A47/A47M malleable iron.

## 2.7 PIPE SUPPORTS, GUIDES, SHIELDS, AND SADDLES

- A. Dielectric Barriers: Provide between metallic supports and metallic piping and associated items of dissimilar type; acceptable dielectric barriers include rubber or plastic sheets or coatings attached securely to pipe or item.
- B. Stanchions:
  1. Material: Malleable iron, ASTM A47/A47M; or carbon steel, ASTM A36/A36M.
  2. Provide coated or plated saddles to isolate steel hangers from dissimilar metal tube or pipe.
  3. For pipe runs, use stanchions of same type and material where vertical adjustment is required for stationary pipe.
- C. U-Bolts:
  1. MSS SP-58 type 24, carbon steel u-bolt for pipe support or anchoring.
- D. Pipe Alignment Guides, Galvanized steel:
  1. Pipe Sizes 8 inch and Smaller: Spider or sleeve type.
  2. Pipe Sizes 10 inch and Larger: Roller type.
- E. Pipe Shields for Insulated Piping:
  1. MSS SP-58 type 40, ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.
  2. General Construction and Requirements:

- a. Surface Burning Characteristics: Comply with ASTM E84 or UL 723.
- b. Shields Material: UV-resistant polypropylene with glass fill.
- c. Maximum Insulated Pipe Outer Diameter: 12-5/8 inch.
- d. Service Temperature: Minus 40 to 178 degrees F.
- e. Pipe shields to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.

F. Pipe Supports:

- 1. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
- 2. Liquid Temperatures Up to 122 degrees F:
  - a. Overhead Support: MSS SP-58 types 1, 3 through 12 clamps.
  - b. Support From Below: MSS SP-58 types 35 through 38.
- 3. Operating Temperatures from 122 to 446 degrees F:
  - a. Overhead Support: MSS SP-58 type 1 or 3 through 12 clamps with appropriate saddle of MSS SP-58 type 40 for insulated pipe.
  - b. Roller Chair: MSS SP-58 types 41 or 43 through 46 roller chair support with appropriate saddle of MSS SP-58 type 39 for insulated pipe.
  - c. Sliding Support: MSS SP-58 types 35 through 38.

G. Pipe Supports, Thermal Insulated:

- 1. General Requirements:
  - a. Insulated pipe supports to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
  - b. Pipe insulation protection shields to be provided at the hanger points and guide locations on pipes requiring insulation as indicated on drawings.

- c. Surface Burning Characteristics: Flame spread index/smoke developed index of 5/30, maximum, when tested in accordance with ASTM E84 or UL 723.
- d. Provide pipe supports for 1/2 to 30 inch iron pipes.
- e. Insulation inserts to consist of rigid phenolic foam insulation surrounded by 360 degree, PVC jacketing.

2. PVC Jacket:

- a. Pipe insulation protection shields to be provided with ball bearing hinge and locking seam.
- b. Minimum Service Temperature: Minus 40 degrees F.
- c. Maximum Service Temperature: 180 degrees F.
- d. Moisture Vapor Transmission: 0.0071 perm inch, when tested in accordance with ASTM E96/E96M.
- e. Minimum Thickness: 60 mil, 0.06 inch.

2.8 SEISMIC BRACING HARDWARE

A. Cable Sway Bracing Systems:

- 1. Cable wire hanger with fix and release spring mechanism enclosed using zinc housing with 302 stainless steel components for pipe or equipment suspension to surface-mounted end-fixing fittings.
- 2. Provide cable wire and end-fixing as required to hold minimum weight of 100 lb.

B. NONPENETRATING ROOFTOP SUPPORTS FOR LOW-SLOPE ROOFS

- C. Provide steel pedestals with thermoplastic or rubber base that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified.
- D. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
- E. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.

F. Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.

G. ANCHORS AND FASTENERS

H. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.

I. Concrete: Use preset concrete inserts or expansion anchors.

J. Solid or Grout-Filled Masonry: Use expansion anchors.

K. Hollow Masonry: Use toggle bolts.

L. Hollow Stud Walls: Use toggle bolts.

M. Steel: Use beam clamps, machine bolts, or welded threaded studs.

N. Sheet Metal: Use sheet metal screws.

O. Wood: Use wood screws.

P. Plastic and lead anchors are not permitted.

Q. Powder-actuated fasteners are not permitted.

R. Hammer-driven anchors and fasteners are not permitted.

S. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.

T. Preset Concrete Inserts: Continuous metal strut channel and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.

1. Channel Material: Use galvanized steel.

2. Manufacturer: Same as manufacturer of metal strut channel framing system.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

- C. Verify that conditions are satisfactory for installation prior to starting work.

### 3.2 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- C. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.
- D. Unless specifically indicated or approved by LP Consulting Engineers, Inc., do not provide support from suspended ceiling support system or ceiling grid.
- E. Unless specifically indicated or approved by LP Consulting Engineers, Inc., do not provide support from roof deck.
- F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- G. Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.
- H. Equipment Support and Attachment:
  - 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
  - 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
  - 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
  - 4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- I. Preset Concrete Inserts: Use manufacturer-provided closure strips to inhibit concrete seepage during concrete pour.
- J. Secure fasteners according to manufacturer's recommended torque settings.
- K. Remove temporary supports.

### 3.3 FIELD QUALITY CONTROL

- A. Inspect support and attachment components for damage and defects.
- B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- C. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION



SECTION 23 05 53  
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Nameplates.
- B. Tags.
- C. Pipe markers.
- D. Ceiling tacks.

1.2 RELATED REQUIREMENTS

- A. Refer to the General Conditions, Special Conditions and Division 1 General Requirements. The requirements of these sections apply to this section.

1.3 REFERENCE STANDARDS

- A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2023.
- B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2017.

1.4 SUBMITTALS

- A. See Division 1 specifications 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.

PART 2 PRODUCTS

2.1 IDENTIFICATION APPLICATIONS

- A. Air Handling Units: Nameplates.
- B. Air Terminal Units: Nameplates.

- C. Control Panels: Nameplates.
- D. Fire and/or Smoke Dampers: Ceiling tacks, where located above lay-in ceiling.
- E. Heat Transfer Equipment: Nameplates.
- F. Major Control Components: Nameplates.
- G. Piping: Pipe markers.
- H. Pumps: Nameplates.
- I. Small-sized Equipment: Tags.
- J. Tanks: Nameplates.
- K. Thermostats: Nameplates.
- L. Valves: Tags and ceiling tacks where located above lay-in ceiling.

## 2.2 MANUFACTURERS

- A. Brady Corporation: [www.bradycorp.com](http://www.bradycorp.com).
- B. Seton Identification Products: [www.seton.com/aec](http://www.seton.com/aec).

## 2.3 NAMEPLATES

- A. Description: Laminated three-layer plastic with engraved letters.
  - 1. Letter Color: White.
  - 2. Letter Height: Air Handling Units, Control panels: 1 inch.
  - 3. Letter Height: All others: 1/4 inch.
  - 4. Background Color: Black.
  - 5. Plastic: Comply with ASTM D709.

## 2.4 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.

## 2.5 PIPE MARKERS

- A. Color: Comply with ASME A13.1.
- B. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings. Secure to pipe using two (2) bands of adhesive tape with flow arrows supplied by the manufacturer. Install securing bands completely around pipe and overlapped.
- C. Underground Plastic Pipe Markers: Bright-colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil, 0.004 inch thick, manufactured for direct burial service.

## 2.6 CEILING TACKS

- A. Description: Steel with 3/4 inch diameter color coded head.
- B. Color code as follows:
  - 1. Fire Dampers and Smoke Dampers: Red.
  - 2. Heating/Cooling Valves: Blue.

## PART 3 EXECUTION

### 3.1 PREPARATION

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

### 3.2 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. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.
- D. Identify fans and filter boxes with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.
- E. Identify chilled/hot water equipment, including chillers, boilers, pumps, expansion tanks, air separators, etc. with plastic nameplates.

- F. Identify air conditioning units, air handling units, heating and ventilating units, exhaust fans, pumps, heat transfer equipment, tanks, fire/smoke damper access doors, and water treatment devices with nameplates. Small devices, such as terminal units, in-line pumps, may be identified with tags.
- G. Identify control panels and major control components outside panels with plastic nameplates.
- H. Identify thermostats/sensors relating to fan unit and/or zone unit with nameplates.
- I. Identify valves in main and branch piping with tags.
- J. Identify piping, concealed or exposed, with plastic pipe markers. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet (6 m) 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.
- K. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

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

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Testing, adjustment, and balancing of air systems.

1.2 RELATED REQUIREMENTS

- A. Refer to the General Conditions, Special Conditions and Division 1 General Requirements. The requirements of these sections apply to this section.

1.3 REFERENCE STANDARDS

- A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition; 2016.
- B. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2008, with Errata (2019).
- C. NEBB (TAB) - Procedural Standard for Testing, Adjusting and Balancing of Environmental Systems; 2019, with Errata (2022).
- D. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2023.

1.4 SUBMITTALS

- A. See Division 1 specifications for submittal procedures.
- B. 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 and include controls contractor to assist in testing, adjusting, and balancing procedures. Submit plan for each phase.
  - 1. Submit to LP Consulting Engineers, Inc..
  - 2. Submit to the Commissioning Authority.
  - 3. Submit four weeks prior to starting the testing, adjusting, and balancing work.
  - 4. Include certification that the plan developer has reviewed Contract Documents, the equipment and systems, and the control system with the LP Consulting Engineers, Inc. and other installers to sufficiently understand the design intent for each system.

5. 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. List of all air flow measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
  - c. Completed planned test sheets listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
  - d. Single-line drawings with system test locations.
  - e. Identification and types of measurement instruments to be used and their most recent calibration date.
  - f. Detailed step-by-step procedures for TAB work for each system and issue, including:
    - 1) SA, RA, EA, OA, for each AHU.
    - 2) Economizer proportioning and vfd speed adjustments.
    - 3) Rechecking.
  - g. Confirmation of understanding of the outside air ventilation criteria under all conditions.
  - h. Method of verifying and setting minimum outside air flow rate will be verified and set and for what level (total building, zone, etc.).
  - i. Method of checking building static and exhaust fan and/or relief damper capacity.
  - j. Procedures for field technician logs of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests (scope and frequency).
- C. 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 LP Consulting Engineers, Inc. within 2 days after completion of testing, adjusting, and balancing.

2. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
3. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
4. Units of Measure: Report data in I-P (inch-pound) units only.
5. Test Reports: Indicate data on AABC MN-1 forms, forms prepared following ASHRAE Std 111, or NEBB forms.
6. 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 Engineer.
  - g. Project altitude.
  - h. Report date.
- D. Test and balance shall be performed by an independent test and balance agency.
- E. Perform total system balance in accordance with AABC MN-1, ASHRAE Std 111, or NEBB Procedural Standards for Testing, Balancing and Adjusting of Environmental Systems.
- F. TAB Agency Qualifications: Company specializing in the testing, adjusting, and balancing of systems specified in this Section with minimum three years documented experience certified by AABC or NEBB.
- G. Perform Work under supervision of AABC Certified Test and Balance Engineer or NEBB Certified Testing, Balancing and Adjusting Supervisor experienced in performance of this Work and licensed at the .

## PART 2 PRODUCTS - NOT USED

## PART 3 EXECUTION

### 3.1 GENERAL REQUIREMENTS

- A. Perform total system balance in accordance with one of the following:
  - 1. AABC (NSTSB), AABC National Standards for Total System Balance.
  - 2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
  - 3. SMACNA (TAB).
- B. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.
- 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.aabc.com/#sle](http://www.aabc.com/#sle); upon completion submit AABC National Performance Guaranty.
    - b. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: [www.tabbcertified.org/#sle](http://www.tabbcertified.org/#sle).
- D. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

### 3.2 TESTING, ADJUSTING, AND BALANCING AGENCIES

- A. RS Analysis Inc.; [www.rsanalysis.com](http://www.rsanalysis.com); (888-330-1935).
- B. Mesa 3; [www.mesa3.com](http://www.mesa3.com); (408-928-3000).
- C. Raglen System Balance; [www.raglensystembalance.com](http://www.raglensystembalance.com); (775-747-0100).
- D. National Air Balance Company Inc.; [www.nabco.biz](http://www.nabco.biz); (510-623-7000).

### 3.3 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. Final filters are clean and in place. If required, install temporary media in addition to final filters.
  4. Duct systems are clean of debris.
  5. Fans are rotating correctly.
  6. Fire and volume dampers are in place and open.
  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. Hydronic systems are flushed, filled, and vented.
  11. Pumps are rotating correctly.
  12. Proper strainer baskets are clean and in place.
  13. Service and balance valves are open.
- B. Contractor to inspect ductwork and piping systems at 60% and 90% completion to verify systems are ready for testing and balancing.
- C. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.
- D. Beginning of work means acceptance of existing conditions.

### 3.4 PREPARATION

- A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to LP Consulting Engineers, Inc. to facilitate spot checks during testing.
- B. Provide additional balancing devices as required.

### 3.5 ADJUSTMENT TOLERANCES

- A. Air Handling Systems: Adjust total airflow(s) to within plus 10 percent and minus 5 percent of design.

- B. Air Outlets and Inlets: Adjust outlets and inlets in space to within plus 10 percent and minus 10 percent of design.
- C. Ventilation Systems: Adjust outside air system components to within plus 10 percent and minus 0 percent of design.
- D. Hydronic Systems: Adjust to within plus 10 percent and minus 5 percent of design.

### 3.6 RECORDING AND ADJUSTING

- A. Field Logs: Maintain written logs including:
  - 1. Running log of events and issues.
  - 2. Discrepancies, deficient or uncompleted work by others.
  - 3. Contract interpretation requests.
  - 4. Lists of completed tests.
- B. Ensure recorded data represents actual measured or observed conditions.
- C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- D. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- E. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
- F. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by Owner.

### 3.7 AIR SYSTEM PROCEDURE

- A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.
- B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
- C. Measure air quantities at air inlets and outlets.
- D. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

- E. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- F. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
- G. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.

### 3.8 TITLE 24 TESTING

- A. Complete applicable Title 24 Acceptance Testing as delineated in contract drawings.

### 3.9 COMMISSIONING

- A. See Division 1, 22, 23 and 26 Commissioning specifications for requirements. Coordinate all requirements with Commissioning Agent.
- B. Perform prerequisites prior to starting commissioning activities.
- C. Assist Commissioning Agent in field verification of test and balance report.
- D. Furnish to the Commissioning Authority, upon request, any data gathered but not shown in the final TAB report.

### 3.10 SCOPE

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

### 3.11 MINIMUM DATA TO BE REPORTED

- A. Electric Motors:
  - 1. Manufacturer.
  - 2. Model/Frame.
  - 3. HP/BHP.

4. Phase, voltage, amperage; nameplate, actual, no load.
5. RPM.
6. Service factor.
7. Starter size, rating, heater elements.
8. Sheave Make/Size/Bore.

B. Cooling Coils:

1. Location.
2. Service.
3. Manufacturer.
4. Air flow, design and actual.
5. Entering air DB temperature, design and actual.
6. Entering air WB temperature, design and actual.
7. Leaving air DB temperature, design and actual.
8. Leaving air WB temperature, design and actual.
9. Saturated suction temperature, design and actual.
10. Air pressure drop, design and actual.

C. Air Moving Equipment:

1. Location.
2. Manufacturer.
3. Model number.
4. Serial number.
5. Arrangement/Class/Discharge.
6. Air flow, specified and actual.
7. Return air flow, specified and actual.
8. Outside air flow, specified and actual.

9. Total static pressure (total external), specified and actual.
10. Inlet pressure.
11. Discharge pressure.
12. Sheave Make/Size/Bore.
13. Number of Belts/Make/Size.
14. Fan RPM.

D. Return Air/Outside Air/Exhaust Air:

1. Identification/location.
2. Design air flow (determined by initial test)
3. Actual air flow.
4. Design return air flow (determined by initial test)
5. Actual return air flow.
6. Design outside air flow (determined by initial test)
7. Actual outside air flow.
8. Return air temperature.
9. Outside air temperature.
10. Actual mixed air temperature.

E. Duct Traverses:

1. System zone/branch.
2. Duct size.
3. Area.
4. Design velocity.
5. Design air flow.
6. Test velocity.
7. Test air flow.

8. Duct static pressure.
9. Air temperature.
10. Air correction factor.

END OF SECTION

SECTION 23 07 13  
DUCT INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Duct insulation.
- B. Duct liner.
- C. Jacketing and accessories.

1.2 RELATED REQUIREMENTS

- A. Refer to the General Conditions, Special Conditions and Division 1 General Requirements. The requirements of these sections apply to this section.
- B. Section 23 31 00 - HVAC Ducts and Casings: Ductwork.

1.3 REFERENCE STANDARDS

- A. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- C. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.
- D. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.
- E. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).
- F. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).
- G. ASTM C916 - Standard Specification for Adhesives for Duct Thermal Insulation; 2020.
- H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

- I. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.
- J. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.
- K. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

#### 1.4 RELATED SECTIONS

- A. The Drawings and General Provisions of the Contract, including the General Conditions, Special Conditions and Division 1 General Requirements apply to this section.
- B. The Contract Agreement, Bidding Documents and all Addenda issued prior to Contract Agreement execution form a part of these specifications and apply to all Contracts or Subcontracts relating to the mechanical systems.
- C. The requirements of this Section apply to all Work of Division 23.

#### 1.5 SUBMITTALS

- A. See Division 1 specifications 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 necessary to ensure acceptable workmanship and that installation standards will be achieved.

#### 1.6 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 three years of experience and approved by manufacturer.

#### 1.7 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.

## 1.8 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

### 2.1 REGULATORY REQUIREMENTS

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

### 2.2 GLASS FIBER, FLEXIBLE

- A. Manufacturer:

- 1. Owens-Corning Fiberglas; Model [All Service Faced Duct Wrap].
  - 2. Knauf Insulation: [www.knaufinsulation.com](http://www.knaufinsulation.com).
  - 3. Johns Manville: [www.jm.com/#sle](http://www.jm.com/#sle).

- B. Insulation: ASTM C553; flexible, noncombustible blanket.

- 1. K value: 0.36 at 75 degrees F, when tested in accordance with ASTM C518.
  - 2. Duct Application: 2" thick, 3/4 pound density.
  - 3. Maximum Water Vapor Absorption: 5.0 percent by weight.

- C. 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.

- D. Vapor Barrier Tape:

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure-sensitive rubber-based adhesive.

## 2.3 GLASS FIBER, RIGID

### A. Manufacturer:

1. CertainTeed Corporation: [www.certainteed.com/#sle](http://www.certainteed.com/#sle).
2. Knauf Insulation: [www.knaufinsulation.com](http://www.knaufinsulation.com).
3. Johns Manville: [www.jm.com/#sle](http://www.jm.com/#sle).
4. Owens Corning Corporation: [www.ocbuildingspec.com/#sle](http://www.ocbuildingspec.com/#sle).

### B. 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 Absorption: 5.0 percent.
4. Density: 3.0 lb/cu ft.

### C. Vapor Barrier Jacket:

1. Kraft paper with glass fiber yarn and bonded to aluminized film.
2. Secure with pressure-sensitive tape.

### D. Vapor Barrier Tape:

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure-sensitive rubber-based adhesive.

## 2.4 JACKETING AND ACCESSORIES

### A. Aluminum Jacket:

1. Comply with ASTM B209/B209M, Temper H14, minimum thickness of 0.016 inch with factory-applied polyethylene and kraft paper moisture barrier on the inside surface.
2. Thickness: 0.020 inch sheet.
3. Finish: Embossed.
4. Joining: Longitudinal slip joints and 2 inch laps.

5. Fittings: 0.016 inch thick die-shaped fitting covers with factory-attached protective liner.
6. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

## 2.5 DUCT LINER

### A. Manufacturers:

1. CertainTeed Corporation: [www.certainteed.com/#sle](http://www.certainteed.com/#sle).
2. Knauf Insulation: [www.knaufinsulation.com](http://www.knaufinsulation.com).
3. Johns Manville: [www.jm.com/#sle](http://www.jm.com/#sle).
4. Owens Corning Corp: [www.owenscorning.com](http://www.owenscorning.com).

### B. Insulation: Incombustible glass fiber complying with ASTM C 1071; flexible blanket; impregnated surface and edges coated with acrylic polymer shown to be fungus and bacteria resistant by testing to ASTM G 21.

1. Apparent Thermal Conductivity: Maximum of 0.31 at 75 degrees F.
2. Duct Application (Indoors): 1" thick, 1-1/2 pound density.
3. Duct Application (Outdoors): 2" thick, 1-1/2 pound density.
4. Service Temperature: Up to 250 degrees F.

### 5. Acoustical Requirements

- a. Sound absorption coefficients of the material (with and/or without erosion resistive coating) shall be greater than or equal to the coefficients listed in the specifications when tested under the specified conditions.
  - b. All acoustical measurements shall be performed in accordance with ANSI/ASTM C423 and shall be performed in the ASTM E795 mounting configuration as indicated.
  - c. An independent acoustical laboratory shall perform the tests.
  - d. The sound absorption coefficient provided by the material shall meet or exceed the following values in each octave band listed:
6. Thickness, 1 inch Hz/Coefficient: 125/.05, 250/.20, 500/.65, 1k/.90, 2k/.95, 4k/.95.

### C. Liner Fasteners: Galvanized steel, welded with integral head.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Test ductwork for design pressure prior to applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.

### 3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Prime and paint exposed ductwork as required by Architect.
- 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 with standard vapor barrier jacket.
  - 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.
- E. Duct and Plenum Liner Application:
  - 1. Adhere insulation with adhesive for 100 percent coverage.
  - 2. Secure insulation with mechanical liner fasteners. Liner shall start within 3 inches of the upstream transverse edges of the liner and 3 inches from the longitudinal joints, and shall be spaced at a maximum of 12 inches on center around the perimeter of the duct (except that they shall be a maximum of 12 inches from a corner break). Elsewhere, they shall be a maximum of 18 inches on center, except that they shall not be placed more than 6 inches from a longitudinal joint of the liner or 12 inches from

a corner break. Refer to SMACNA HVAC Duct Construction Standards - Metal and Flexible for spacing.

3. Seal and smooth joints. Seal and coat transverse and longitudinal joints.
4. Seal liner surface penetrations with adhesive.
5. Duct dimensions indicated are inside dimensions and do not include consideration for liner thickness.

### 3.3 SCHEDULES

- A. Supply and Return Ducts: Insulate all unlined ducts, except ducts exposed in conditioned spaces.
- B. Exterior Applications:
  1. Supply and Return Ducts exposed to outdoors to be internally lined except ductwork conveying direct evaporatively cooled air.
  2. Supply and Return ductwork exposed to outdoors for direct evaporatively cooling systems to be externally insulated. Cover insulation with with calked aluminum jacket with seams located on bottom side of horizontal duct section.
- C. Supply and Return Ducts: Install lining within 10 feet of fan on all ductwork and where shown on drawings where longer lining lengths has been shown.

END OF SECTION



SECTION 23 07 19  
HVAC PIPING INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

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

1.2 RELATED REQUIREMENTS

- A. Refer to the General Conditions, Special Conditions and Division 1 General Requirements. The requirements of these sections apply to this section.
- B. Section 23 21 13 - Hydronic Piping: Placement of hangers and hanger inserts.

1.3 REFERENCE STANDARDS

- A. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- B. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2021.
- C. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation; 2017 (Reapproved 2023).
- D. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2023.
- E. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2022a.
- F. ASTM C585 - Standard Practice for Inner and Outer Diameters of Thermal Insulation for Nominal Sizes of Pipe and Tubing; 2022.
- G. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2023).
- H. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation; 2023.
- I. ASTM C1423 - Standard Guide for Selecting Jacketing Materials for Thermal Insulation; 2021.

- J. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2019.
- K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- L. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2023.
- M. ASTM E2178 - Standard Test Method for Determining Air Leakage Rate and Calculation of Air Permeance of Building Materials; 2021a.
- N. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).
- O. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

#### 1.4 SUBMITTALS

- A. See Division 1 specifications 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.

#### 1.5 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 three years of experience.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

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

#### 1.7 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

### 2.1 REGULATORY REQUIREMENTS

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

### 2.2 GLASS FIBER, RIGID

- A. Manufacturers:

- 1. CertainTeed Corporation: [www.certainteed.com](http://www.certainteed.com).
- 2. Johns Manville Corporation: [www.jm.com/#sle](http://www.jm.com/#sle).
- 3. Knauf Insulation: [www.knaufusa.com](http://www.knaufusa.com).
- 4. Owens Corning Corporation: [www.ocbuildingspec.com/#sle](http://www.ocbuildingspec.com/#sle).

- B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.

- 1. "K" value: ASTM C 177:
  - a. 0.24 to 0.28 at 100 degrees mean rating temperature.
  - b. 0.25 to 0.29 at 125 degrees mean rating temperature.
  - c. 0.27 to 0.30 at 150 degrees mean rating temperature.
  - d. 0.29 to 0.31 at 200 degrees mean rating temperature.
  - e. 0.32 to 0.34 at 250 degrees mean rating temperature.
- 2. Maximum Service Temperature: 850 degrees F.
- 3. Maximum Moisture Absorption: 0.2 percent by volume.

- C. 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.

- D. Vapor Barrier Lap Adhesive: Compatible with insulation.

### 2.3 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

- A. Manufacturers:

- 1. Armacell LLC: [www.armacell.us/#sle](http://www.armacell.us/#sle).

2. K-Flex USA LLC: [www.kflexusa.com/#sle](http://www.kflexusa.com/#sle).
- B. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
  1. Minimum Service Temperature: Minus 40 degrees F.
  2. Maximum Service Temperature: 180 degrees F.
  3. Connection: Waterproof vapor barrier adhesive.
- C. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.
- D. Weather Barrier Coating: Air dried, contact adhesive, compatible with insulation and ASTM E84 compliant.
- E. Insulation Exposed to the Weather: Finish with two coats Armstrong white Armaflex finish. Provide aluminum jacketing.

## 2.4 JACKETING AND ACCESSORIES

- A. PVC Plastic.
  1. 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, 0.010 inch.
    - e. Connections: Brush on welding adhesive.
- B. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.
  1. Thickness: 0.016 inch sheet.
  2. Finish: Embossed.
  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.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Test piping for design pressure, liquid tightness, and continuity prior to applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

### 3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Exposed Piping: Locate insulation and cover seams in least visible locations.
- C. 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: Pipe saddle.
- D. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions.
- E. Pipe Exposed in Mechanical Closets or Finished Spaces: Finish with PVC jacket and fitting covers.
- F. 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. Provide two coats of UV resistant finish for flexible elastomeric cellular insulation without jacketing.

### 3.3 SCHEDULE

- A. Heating Systems:

1. Heating Water Supply and Return:

a. Glass Fiber Insulation:

- 1) Pipe Size Range: 1 inches and smaller.
  - a) Thickness: 1-1/2 inch.
- 2) Pipe Size Range: 1-1/2 inches and larger.
  - a) Thickness: 2 inch.

B. Cooling Systems:

1. Chilled Water:

a. Glass Fiber Insulation:

- 1) Pipe Size Range: 1 inches and smaller.
  - a) Thickness: 1 inch.
- 2) Pipe Size Range: 1-1/2" and larger.
  - a) Thickness: 1-1/2 inch.

2. Refrigerant Suction:

a. Flexible Elastic Cellular Insulation:

- 1) Pipe Size Range: 3/4 inch and smaller.
  - a) Thickness: 1 inch.
- 2) Pipe Size Range: 1 inch and larger.
  - a) Thickness: 1.5 inch.

3. Refrigerant Hot Gas:

a. Flexible Elastic Cellular Insulation:

- 1) Pipe Size Range: 3/4 inch and smaller.
  - a) Thickness: 1 inch.
- 2) Pipe Size Range: 1 inch and larger.
  - a) Thickness: 1.5 inch.

END OF SECTION



## SECTION 23 21 13 HYDRONIC PIPING

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Hydronic system requirements.
- B. Heating water piping, above grade.
- C. Chilled water piping, above grade.
- D. Condenser water piping, above grade.
- E. Pipe hangers and supports.
- F. Unions, flanges, mechanical couplings, and dielectric connections.
- G. Valves:
  - 1. Ball valves.
- H. Flow controls.

#### 1.2 RELATED REQUIREMENTS

- A. Refer to the General Conditions, Special Conditions and Division 1 General Requirements. The requirements of these sections apply to this section.
- B. Section 23 05 53 - Identification for HVAC Piping and Equipment.
- C. Section 23 07 19 - HVAC Piping Insulation.

#### 1.3 REFERENCE STANDARDS

- A. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2023, with Errata (2024).
- B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.
- C. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.
- D. ASME B31.9 - Building Services Piping; 2020.
- E. ASTM B32 - Standard Specification for Solder Metal; 2020.
- F. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.

- G. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers; 2024.
- H. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2019.
- I. AWS D10.12M/D10.12 - Guide for Welding Mild Steel Pipe; 2000.
- J. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).

#### 1.4 SYSTEM DESCRIPTION

- A. Where more than one piping system material is specified, ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.
- B. Use unions, flanges, and couplings downstream of valves and at equipment or apparatus connections. Do not use direct welded or threaded connections to valves, equipment or other apparatus.
- C. Use non-conducting dielectric connections whenever jointing dissimilar metals in open and closed systems.
- D. Provide pipe hangers and supports in accordance with ASME B31.9 unless indicated otherwise.
- E. Use ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- F. Use 3/4 inch ball valves with cap for drains at main shut-off valves, low points of piping, bases of vertical risers, and at equipment.

#### 1.5 RELATED SECTIONS

- A. The Drawings and General Provisions of the Contract, including the General Conditions, Special Conditions and Division 1 General Requirements apply to this section.
- B. The Contract Agreement, Bidding Documents and all Addenda issued prior to Contract Agreement execution form a part of these specifications and apply to all Contracts or Subcontracts relating to the mechanical systems.
- C. The requirements of this Section apply to all Work of Division 23.

#### 1.6 SUBMITTALS

- A. See Division 1 specifications for submittal procedures.
- B. Preinsulated Underground Piping System: Provide manufacturer's shop drawings with dimensioned piping layout and details of all expansion loops, elbows, anchor points, building and/or manhole entry points and all other pertinent information needed to verify that the type of materials being offered are in accordance with these specifications. Prefabricated pipe units are to be subsequently dimensionalized and numbered to fit actual job conditions as field verified by the installing contractor prior to the start of factory fabrication work.
- C. Welders Certificate: Include welders certification of compliance with ASME BPVC-IX.
- D. Manufacturer's Installation Instructions: Indicate hanging and support methods, joining procedures.
- E. Project Record Documents: Record actual locations of valves.
- F. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

#### 1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified in this section with minimum three years of experience.
- C. Welder Qualifications: Certify in accordance with ASME BPVC-IX.

#### 1.8 REGULATORY REQUIREMENTS

- A. Conform to ASME B31.9 code for installation of piping system.
- B. Welding Materials and Procedures: Conform to ASME (BPV IX) and applicable state labor regulations.
- C. Provide certificate of compliance from authority having jurisdiction, indicating approval of welders.

#### 1.9 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.

## PART 2 PRODUCTS

### 2.1 HYDRONIC SYSTEM REQUIREMENTS

- A. Comply with ASME B31.9 and applicable federal, state, and local regulations.
- B. Piping: Provide piping, fittings, hangers, and supports as required, as indicated, and as follows:
  - 1. Where more than one piping system material is specified, provide joining fittings that are compatible with piping materials and ensure that the integrity of the system is not jeopardized.
  - 2. Use non-conducting dielectric connections whenever jointing dissimilar metals.
  - 3. Grooved mechanical joints may be used in accessible locations only.
    - a. Accessible locations include those exposed on interior of building, in pipe chases, and in mechanical rooms, aboveground outdoors, and as approved by LP Consulting Engineers, Inc..
    - b. Use rigid joints unless otherwise indicated.
  - 4. Provide pipe hangers and supports in accordance with ASME B31.9 or MSS SP-58 unless indicated otherwise.
- C. Pipe-to-Valve and Pipe-to-Equipment Connections: Use unions to allow disconnection of components for servicing; do not use direct welded, soldered, or threaded connections.
- D. Valves: Provide valves where indicated:
  - 1. Provide drain valves where indicated, and if not indicated, provide at least at main shut-off, low points of piping, bases of vertical risers, and at equipment. Use 3/4 inch gate valves with cap; pipe to nearest floor drain.
  - 2. On discharge of condenser water pumps, use spring-loaded check valves.

3. Isolate equipment using butterfly valves with lug end flanges or grooved mechanical couplings.
4. For throttling, bypass, or manual flow control services, use globe, ball, or butterfly valves.
5. For throttling and isolation service in chilled and condenser water systems, use only butterfly valves.
6. For shut-off and to isolate parts of systems or vertical risers, use ball valves.

E. Welding Materials and Procedures: Comply with ASME BPVC-IX.

## 2.2 HEATING WATER PIPING, ABOVE GROUND

A. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), drawn, using one of the following joint types:

1. Joints: For sizes 1-1/2" and smaller, Solder, lead free, ASTM B 32, 95-5 tin-antimony, or tin and silver.
2. Joints: For sizes 2" and larger, AWS A5.8, BCuP-5 silver braze.

## 2.3 CHILLED WATER PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M, Schedule 40, black; using one of the following joint types:

1. Welded Joints: ASTM A234/A234M, wrought steel welding type fittings; AWS D10.12M/D10.12 welded.
2. Threaded Joints: ASME B16.3, malleable iron fittings.
3. Grooved Joints: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.
4. Joints, 2-1/2 inch and larger: AWS D1.1 welded or grooved couplings.

B. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), hard drawn; using one of the following joint types:

1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22, solder wrought copper fittings.
  - a. Solder: ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.

b. Braze: AWS A5.8M/A5.8 BCuP copper/silver alloy.

2. Joints: Solder, lead free, ASTM B 32, HB alloy (95-5 tin-antimony), or tin and silver. Solder, lead free, ASTM B 32, HB alloy (95-5 tin-antimony), or tin and silver. Solder, lead free, ASTM B 32, HB alloy (95-5 tin-antimony), or tin and silver.
3. Joints: For sizes 2" and larger, AWS A5.8, BCuP-5 silver braze.

## 2.4 CONDENSER WATER PIPING, ABOVE GRADE

A. Steel Pipe: ASTM A53/A53M, Schedule 40, black.

1. Welded Joints: ASTM A234/A234M, wrought steel welding type fittings with finish matching piping; AWS D10.12M/D10.12 welded.
2. Threaded Joints: ASME B16.3, malleable iron fittings with finish matching piping.
3. Grooved Joints: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.
4. Fittings: ASME B16.3, galvanized malleable iron or ASTM A 234/A 234M, galvanized forged steel welding type.
5. Joints, 2" and smaller: Threaded.
6. Joints, 2-1/2 inch and larger: AWS D1.1 welded or grooved couplings.

## 2.5 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.
- B. Hangers for Pipe Sizes 1/2 to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
- C. Hangers for Hot Pipe Sizes 2 to 4 Inches: Carbon steel, adjustable, clevis.
- D. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
- E. Vertical Support: Steel riser clamp.
- F. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

- G. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

## 2.6 UNIONS, FLANGES, MECHANICAL COUPLINGS, AND DIELECTRIC CONNECTIONS

### A. Unions for Pipe 1-1/2 Inches and Under:

1. Ferrous Piping: 150 psi brass or malleable iron, threaded.
2. Copper Pipe: Bronze, soldered joints.

### B. Flanges for Pipe 2 Inches and Greater:

1. Ferrous Piping: 150 psig forged steel, slip-on.
2. Copper Piping: Bronze.
3. Gaskets: 1/16 inch thick, preformed neoprene.

## 2.7 FLOW CONTROLS

### A. Manufacturers:

1. Bell & Gossett.
2. Griswold Controls.
3. Taco, Inc: [www.taco-hvac.com/#sle](http://www.taco-hvac.com/#sle).

- B. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.

- C. Calibration: Control flow within 10 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, minimum pressure 2 psi.

## PART 3 EXECUTION

### 3.1 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 using jointing system specified.

- D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.
- E. After completion, fill, clean, and treat systems. See Pipe Cleaning Sequence below for additional requirements.

### 3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install heating water piping to ASME B31.9 requirements.
- C. Route piping in orderly manner, parallel to building structure, and maintain gradient.
- D. Install piping to conserve building space and to avoid interference with use of space.
- E. Group piping whenever practical at common elevations.
- F. Sleeve pipe passing through partitions, walls, and floors.
- G. Slope piping and arrange to drain at low points.
- H. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- I. Pipe Hangers and Supports:
  - 1. Install in accordance with ASME B31.9, ASTM F708, or MSS SP-58.
  - 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 inches minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
  - 6. Support vertical piping at every other 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.

- J. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- K. Provide access where valves and fittings are not exposed.
- L. Use eccentric reducers to maintain top of pipe level.
- M. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welds.
- N. Prepare unfinished pipe, fittings, supports, and accessories, ready for finish painting.
- O. Install valves with stems upright or horizontal, not inverted.

### 3.3 PIPE CLEANING SEQUENCE

- A. Hot Water Heating Systems (metal piping only):
  - 1. Flush piping at each coil strainer. Remove, clean, and reinstall screen.

### 3.4 SCHEDULES

- A. Hanger Spacing for Copper Tubing.
  - 1. 1/2 Inch and 3/4 inch: Maximum span, 5 feet; minimum rod size, 1/4 inch.
  - 2. 1 Inch: Maximum span, 6 feet; minimum rod size, 1/4 inch.
  - 3. 1-1/2 Inches and 2 Inches: Maximum span, 8 feet; minimum rod size, 3/8 inch.
  - 4. 2-1/2 Inches: Maximum span, 9 feet; minimum rod size, 3/8 inch.
  - 5. 3 Inches: Maximum span, 10 feet; minimum rod size, 3/8 inch.

END OF SECTION



SECTION 23 31 00  
HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Metal ducts.
- B. Flexible ducts.
- C. Air plenums and casings.
- D. Ducts for kitchen exhaust applications.

1.2 RELATED REQUIREMENTS

- A. Refer to the General Conditions, Special Conditions and Division 1 General Requirements. The requirements of these sections apply to this section.
- B. Section 230713 - Duct Insulation.
- C. Section 23 33 00 - Air Duct Accessories.

1.3 REFERENCE STANDARDS

- A. ASHRAE Std 126 - Method of Testing HVAC Air Ducts; 2020.
- B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.
- C. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.
- D. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- F. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2024.
- G. ASTM E2336 - Standard Test Methods for Fire Resistive Grease Duct Enclosure Systems; 2020.
- H. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

- I. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2024.
- J. NFPA 91 - Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Particulate Solids; 2020.
- K. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2024.
- L. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.
- M. SMACNA (KVS) - Kitchen Ventilation Systems and Food Service Equipment Fabrication and Installation Guidelines; 2001.
- N. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Current Edition, Including All Revisions.
- O. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.
- P. UL 1978 - Grease Ducts; Current Edition, Including All Revisions.
- Q. UL 2221 - Tests of Fire Resistive Grease Duct Enclosure Assemblies; Current Edition, Including All Revisions.

#### 1.4 RELATED SECTIONS

- A. The Drawings and General Provisions of the Contract, including the General Conditions, Special Conditions and Division 1 General Requirements apply to this section.
- B. The Contract Agreement, Bidding Documents and all Addenda issued prior to Contract Agreement execution form a part of these specifications and apply to all Contracts or Subcontracts relating to the mechanical systems.
- C. The requirements of this Section apply to all Work of Division 23.

#### 1.5 SUBMITTALS

- A. See Division 1 specifications for submittal procedures.
- B. Product Data: Provide data for duct materials.
- C. Shop Drawings: Indicate duct fittings, particulars such as gages, sizes, welds, and configuration prior to start of work for all ductwork systems. Provide 1/4"=1'-0" ductwork layout plans showing duct routing, offsets, fittings, duct accessories, fire/smoke dampers, hydronic piping,

seismic bracing, etc. Shop drawings shall be fully coordinated with all other trades, including the building structure, finishes, fire sprinkler piping, plumbing piping, hydronic piping and electrical systems.

- D. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

## 1.6 QUALITY ASSURANCE

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

## 1.7 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

## 2.1 GENERAL REQUIREMENTS

- A. Provide UL Class 1 ductwork, fittings, hangers, supports, and appurtenances in accordance with NFPA 90A, NFPA 90B, and SMACNA (DCS) guidelines unless stated otherwise.
- B. Ductwork to be galvanized steel unless otherwise indicated.
- C. Duct Sealing and Leakage in accordance with Static Pressure Class:
  - 1. Duct Pressure Class and Material for Common Mechanical Ventilation Applications:
    - a. Supply Air: 2 in-wc pressure class, galvanized steel.
    - b. Outside Air Intake: 1/2 in-wc pressure class, galvanized steel.
    - c. Return and Relief Air: 1 in-wc 2 in-wc pressure class, galvanized steel.

- d. General Exhaust Air: 1/2 in-wc pressure class, galvanized steel.
- 2. Low Pressure Service: Up to 2 in-wc:
  - a. Seal: Class C, apply to seal off transverse joints.
- 3. Low Pressure Service: From 2 in-wc to 3 in-wc:
  - a. Seal: Class B, apply sealing of transverse joints and longitudinal seams.
- 4. Medium and High Pressure Service: Above 3 in-wc:
  - a. Seal: Class A, apply sealing of transverse joints, longitudinal seams, and duct wall penetrations.

D. Duct Fabrication Requirements:

- 1. Duct and Fitting Fabrication and Support: SMACNA (DCS) including specifics for continuously welded round and oval duct fittings.
- 2. Use reinforced and sealed sheet-metal materials at recommended gauges for indicated operating pressures or pressure class.
- 3. Construct tees, 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 airfoil turning vanes of perforated metal with glass fiber insulation.
- 4. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.
- 5. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- 6. 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.
- 7. Exposed ductwork within occupied spaces shall be 20 gauge minimum.

2.2 METAL DUCTS

A. Material Requirements:

1. Galvanized Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G90/Z275 coating.

2. Stainless Steel: ASTM A666, Type 304.

- a. Application: Kitchen exhaust.

B. Round Spiral Duct:

1. Round spiral lock seam duct with galvanized steel outer wall.

2. Manufacturers:

- a. EHG, a DMI Company: [www.ehgduct.com/#sle](http://www.ehgduct.com/#sle).

- b. Elgen Manufacturing Company, Inc: [www.elgenmfg.com/#sle](http://www.elgenmfg.com/#sle).

- c. Linx Industries, Inc, a DMI Company: [www.li-hvac.com/#sle](http://www.li-hvac.com/#sle).

- d. MKT Metal Manufacturing: [www.mktduct.com/#sle](http://www.mktduct.com/#sle).

C. Connectors, Fittings, Sealants, and Miscellaneous:

1. Fittings: Manufacture with solid inner wall of perforated galvanized steel.

2. Transverse Duct Connection System: SMACNA "E" rated rigid class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips in accordance with SMACNA (DCS).

- a. Manufacturers:

- 1) Carlisle HVAC Products: [www.carlislehvac.com/#sle](http://www.carlislehvac.com/#sle).

- 2) Ductmate Industries, Inc, a DMI Company  
: [www.ductmate.com/#sle](http://www.ductmate.com/#sle).

- 3) Elgen Manufacturing Company, Inc: [www.elgenmfg.com/#sle](http://www.elgenmfg.com/#sle).

3. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.

- a. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.

- b. VOC Content: Not more than 250 g/L, excluding water.

- c. Sealants intended for use outdoors to include UV inhibitors.

- d. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.
- e. Manufacturers:
  - 1) Carlisle HVAC Products; Hardcast Duct-Seal 321 Indoor/Outdoor Water Based Duct Sealant: [www.carlislehvac.com/#sle](http://www.carlislehvac.com/#sle).
  - 2) Design Polymeric; DP 1010 Water Based Smooth Duct Sealant, Premium Quality: [www.designpoly.com/#sle](http://www.designpoly.com/#sle).
  - 3) Ductmate Industries, Inc, a DMI Company  
: [www.ductmate.com/#sle](http://www.ductmate.com/#sle).
- 4. Gasket Tape:
  - a. Provide butyl rubber gasket tape for a flexible seal between transfer duct connector (TDC), transverse duct flange (TDF), applied flange connections, and angle ring connections.
  - b. Manufacturers:
    - 1) Design Polymeric; DP 1040 100 Percent Solids, High Pressure/High-Velocity Butyl Gasket Tape: [www.designpoly.com/#sle](http://www.designpoly.com/#sle).
    - 2) Elgen Manufacturing Company, Inc; 440 Butyl Gasket Tape: [www.elgenmfg.com/#sle](http://www.elgenmfg.com/#sle).

## 2.3 FLEXIBLE DUCTS

### A. Flexible Air Ducts:

- 1. UL 181, Class 1, multiple layers of aluminum laminate supported by helically wound spring steel wire.
- 2. Insulation: Fiberglass insulation with polyethylene vapor barrier film.
- 3. Pressure Rating: From 4 in-wc positive to 0.5 in-wc negative.
- 4. Maximum Velocity: 4,000 fpm.
- 5. Temperature Range: Minus 20 to 210 degrees F.
- 6. Manufacturers:
  - a. JP Lamborn Co: [www.jpflex.com/#sle](http://www.jpflex.com/#sle).

b. Atco Rubber Products, Inc..

## 2.4 AIR PLENUMS AND CASINGS

- A. Fabricate in accordance with SMACNA (DCS) for indicated operating pressures indicated.
- B. Minimum Fabrication Requirements:
  - 1. Fabricate acoustic plenum or casing with reinforcing turned inward.
  - 2. Provide 16-gauge, 0.059-inch sheet steel back facing and 22-gauge, 0.029-inch perforated sheet steel front facing with 3/32 inch diameter holes on 5/32 inch centers.
  - 3. Construct panels 1 inches thick, packed with 4.5 pcf minimum glass fiber insulation media, on inverted channel of 16-gauge, 0.059-inch sheet steel.
- C. Access Doors:
  - 1. Install hinged access doors where indicated or required for access to equipment for cleaning and inspection.
  - 2. Reinforce door frames with steel angles tied to horizontal and vertical plenum supporting angles.

## 2.5 DUCTS FOR KITCHEN EXHAUST APPLICATIONS

- A. Provide ductwork, fittings, and appurtenances in accordance with NFPA 96, SMACNA (KVS), UL 1978, and UL 2221 requirements and guidelines.
- B. Class 1 duct for air with gas and grease particle exhaust at an air velocity of 1,500 to 2,500 fpm.
- C. Where ducts are not self-draining back to equipment, provide low-point drain pocket with the copper drain pipe to a sanitary sewer.
- D. Design, fabricate, and install liquidtight preventing exhaust leakage into building.
- E. Dishwasher Exhaust Duct:
  - 1. Duct Size: 1 in-wc pressure class stainless steel.
  - 2. Fabricate using single wall, 16-gauge, 0.059-inch sheet steel with continuous external welded joints to form rectangular sections.

F. Kitchen Hood and Grease Exhaust Duct:

1. Fabricate in accordance with ductwork manufacturer's instructions, SMACNA (DCS), SMACNA (KVS), and NFPA 96.
2. Round, Single-Wall, Premanufactured Grease Exhaust Duct:
  - a. UL Listed and labeled to UL 1978.
  - b. Construct of 20-gauge, 0.035-inch Type 304 stainless steel.
3. Rectangular, Single-Wall, Premanufactured Grease Exhaust Duct:
  - a. UL Listed and labeled to UL 1978.
  - b. Construct of 16-gauge, 0.059-inch sheet steel using continuous external welded joints in rectangular sections.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install, support, and seal ducts in accordance with SMACNA (DCS).
- B. Install products following the manufacturer's instructions.
- C. Comply with safety standards NFPA 90A and NFPA 90B.
- D. During construction, provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering the ductwork system.
- E. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- F. Ductwork exposed to view outdoors shall be primed and painted, color by architect.
- G. Flexible Ducts: Connect to metal ducts with adhesive plus sheet metal screws.
- H. Flexible Ducts: Maximum length of single runout to air inlet or outlet to be 5 feet per CMC.
- I. Duct sizes indicated are outside dimensions. For lined ducts, duct sizes must be increased to account for lining.

- J. Seal all standing seams and transverse joints in all sheetmetal ductwork with Hardcast DT tape, 4 inches wide, and Hardcast FTA-20 adhesive.
- K. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- L. Use double nuts and lock washers on threaded rod supports.
- M. Connect diffusers boots to low pressure ducts directly or with 5 feet maximum length of flexible duct held in place with strap or clamp.
- N. Use stainless steel for ductwork exposed to view in Kitchen areas.
- O. Kitchen hood exhaust ductwork shall so be constructed and installed that grease cannot be pocketed in any portion thereof, and the system shall slope not less than 1/4 unit vertical in 12 units horizontal (2% slope) toward the hood or toward an approved grease reservoir.
- P. Kitchen hood exhaust ductwork shall be wrapped with a 2 hour fire resistive duct wrap designed for use specifically with kitchen grease ducts, installed in accordance with manufacturer's installation instructions.
- Q. Grease ductwork systems shall be leakage tested per CMC 510.5.3.1 and CMC 510.5.6. Perform light test: A light of no less than 100 watts is passed through the entire duct system, including the hood-to-duct connection. If any light shines through any portion of the ductwork in a darkened room, the hole must be found and welded so that the light is no longer visible.

END OF SECTION



SECTION 23 33 00  
AIR DUCT ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Air turning devices.
- B. Backdraft dampers - metal.
- C. Combination fire and smoke dampers.
- D. Duct access doors.
- E. Duct test holes.
- F. Fire dampers.
- G. Flexible duct connectors.
- H. Volume control dampers.
- I. Miscellaneous Products:
  - 1. Damper operators.

1.2 RELATED REQUIREMENTS

- A. Refer to the General Conditions, Special Conditions and Division 1 General Requirements. The requirements of these sections apply to this section.
- B. Section 23 31 00 - HVAC Ducts and Casings.

1.3 REFERENCE STANDARDS

- A. AMCA 500-D - Laboratory Methods of Testing Dampers for Rating; 2018.
- B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- C. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.
- D. NFPA 92 - Standard for Smoke Control Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

- E. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2024.
- F. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.
- G. UL 33 - Safety Heat Responsive Links for Fire-Protection Service; Current Edition, Including All Revisions.
- H. UL 555 - Standard for Fire Dampers; Current Edition, Including All Revisions.
- I. UL 555C - Standard for Safety Ceiling Dampers; Current Edition, Including All Revisions.
- J. UL 555S - Standard for Smoke Dampers; Current Edition, Including All Revisions.
- K. UL 1978 - Grease Ducts; Current Edition, Including All Revisions.

#### 1.4 RELATED SECTIONS

- A. The Drawings and General Provisions of the Contract, including the General Conditions, Special Conditions and Division 1 General Requirements apply to this section.
- B. The Contract Agreement, Bidding Documents and all Addenda issued prior to Contract Agreement execution form a part of these specifications and apply to all Contracts or Subcontracts relating to the mechanical systems.
- C. The requirements of this Section apply to all Work of Division 23.

#### 1.5 SUBMITTALS

- A. See Division 1 specifications for submittal procedures.
- B. Product Data: Provide for shop fabricated assemblies including volume control dampers, duct access doors, duct test holes, and hardware used. Include electrical characteristics and connection requirements.

#### 1.6 PROJECT RECORD DOCUMENTS

- A. Record actual locations of access doors and test holes.

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

## 1.8 DELIVERY, STORAGE, AND HANDLING

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

## PART 2 PRODUCTS

### 2.1 AIR TURNING DEVICES

#### A. Manufacturers:

1. ProRail, Ductmate Industries, Inc.
2. Duro Dyne Corp.

- B. Manufactured turning vanes with 2" single thickness curved blades set at 1-1/2" on-center mounted in 2" vane rails, self-aligning, hot dipped galvanized steel.

- C. Turning vanes, vane rails and mounting shall be constructed and installed in accordance with the SMACNA "HVAC Duct Construction Standards".

### 2.2 BACKDRAFT DAMPERS - METAL

- A. Gravity Backdraft Dampers, Size 18 by 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.

### 2.3 COMBINATION FIRE AND SMOKE DAMPERS

#### A. Manufacturers:

1. Pottorff: [www.pottorff.com/#sle](http://www.pottorff.com/#sle).
2. Ruskin Company: [www.ruskin.com/#sle](http://www.ruskin.com/#sle).

- B. Fabricate in accordance with NFPA 90A, UL 555, UL 555S, and as indicated.

- C. Provide factory sleeve and collar for each damper.

- D. Multiple Blade Dampers: Fabricate with 16 gauge, 0.0598 inch galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, stainless steel jamb seals, 1/8 by 1/2 inch plated steel concealed linkage, stainless steel closure spring, blade stops, and lock, and 1/2 inch actuator shaft.
- E. Operators: UL listed and labelled oil immersed with spring return electric type suitable for 120 volts, single phase, 60 Hz. Provide end switches to indicate damper position. Locate damper operator on exterior of duct and link to damper operating shaft. Provide circuitry to activate pilot light on remote key (test) switch located in corridor ceiling adjacent to damper.
- F. All actuators for combination fire and smoke dampers or smoke dampers shall be rated for continuous "On" duty and shall have a cycle time requirement of no more frequently than every six months.

## 2.4 DUCT ACCESS DOORS

### A. Manufacturers:

- 1. Ductmate Industries, Inc, a DMI Company: [www.ductmate.com/#sle](http://www.ductmate.com/#sle).
- 2. Ruskin Company: [www.ruskin.com/#sle](http://www.ruskin.com/#sle).
- 3. or equal.

### B. Fabrication: Rigid and close fitting of galvanized steel with sealing gaskets and quick-fastening locking devices. For insulated ducts, install minimum 1-inch thick insulation with sheet metal cover.

- 1. High Temperature Duct Access Doors:
  - a. Comply with NFPA 96.
  - b. Comply with UL 1978.

### C. Access doors with sheet metal screw fasteners are not acceptable.

## 2.5 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.

## 2.6 FIRE DAMPERS

### A. Manufacturers:

- 1. Pottorff: [www.pottorff.com/#sle](http://www.pottorff.com/#sle).

2. Ruskin Company: [www.ruskin.com/#sle](http://www.ruskin.com/#sle).
- B. Fabricate in accordance with NFPA 90A and UL 555, and as indicated.
- C. Ceiling (Radiation) Dampers: Galvanized steel, 22-gauge, 0.0299-inch frame and 16-gauge, 0.0598-inch flap, two layers of 0.125-inch thick ceramic fiber on top side and one layer on bottom side for round flaps, with locking clip.
  1. Rated for three hour service in compliance with UL 555C.
- D. Horizontal Dampers: Galvanized steel, 22-gauge, 0.0299-inch frame, stainless steel closure spring, and lightweight, heat-retardant, non-asbestos fabric blanket.
- E. Curtain Type Dampers: Galvanized steel with interlocking blades. Provide stainless steel closure springs and latches for horizontal installations. Configure with blades out of air stream except for 1-inch pressure-class ducts up to 12 inches in height.
- F. Multiple Blade Dampers: 16-gauge, 0.0598-inch galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, 1/8 by 1/2 inch plated steel concealed linkage, stainless steel closure spring, blade stops, and lock.
- G. Fusible Links: UL 33, separate at 160 degrees F with adjustable link straps for combination fire/balancing dampers.

## 2.7 FLEXIBLE DUCT CONNECTORS

- A. Manufacturers:
  1. Carlisle HVAC Products: [www.carlislehvac.com/#sle](http://www.carlislehvac.com/#sle).
  2. Ductmate Industries, Inc, a DMI Company: [www.ductmate.com/#sle](http://www.ductmate.com/#sle).
- B. Fabricate in accordance with SMACNA (DCS) and as indicated.
- C. Flexible Duct Connections (Indoors): 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/sq yd.
    - a. Net Fabric Width: Approximately 2 inches wide.
  2. Metal: 3 inches wide, 24 gauge, 0.0239 inch thick galvanized steel.
- D. Flexible Duct Connections (Outdoors): Fabric crimped into metal edging strip.

1. Fabric: Ventfabrics Ventlon UL listed fire-retardant duPont's Hypalon coated woven glass fiber fabric to NFPA 90A, minimum density 26 oz per sq yd, sunlight, ozone and weather resistant.
  - a. Net Fabric Width: Approximately 3 inches wide.
2. Metal: 3 inches wide, 24 gage thick galvanized steel.

## 2.8 VOLUME CONTROL DAMPERS

### A. Manufacturers:

1. Nailor Industries, Inc: [www.nailor.com/#sle](http://www.nailor.com/#sle).
2. Ruskin Company: [www.ruskin.com/#sle](http://www.ruskin.com/#sle).
3. United Enertech: [www.unitedenertech.com/#sle](http://www.unitedenertech.com/#sle).

### B. Fabricate in accordance with SMACNA (DCS) and as indicated.

### C. Single Blade Dampers for Round Ductwork and Rectangular Ductwork up to 10 inches in Height: 18 gauge steel minimum.

### D. Multi-Blade Damper for Rectangular Ductwork: 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; Model CD35 Manufactured by Ruskin. Provide Ruskin Model CD50 for installation in medium pressure ductwork and/or ducts with velocities exceeding 1500 FPM.

### E. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings, Ventlok Model 607. 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.

## 2.9 MISCELLANEOUS PRODUCTS

### A. Remote Balancing Damper Operator: Cable operated remote damper controller.

1. Manufacturers:
  - a. Young Regulator Co.; [www.youngregulator.com](http://www.youngregulator.com)
2. "Bowden" damper regulator with mounting bracket, hub and cable coupling.
3. "Bowden" stainless steel operating cable and control wrench. Cable to be 50 foot length standard.
4. Recessed control box with control shaft, cable coupling and cover plate.
5. Provide options and accessories as needed for balancing damper.

### PART 3 EXECUTION

#### 3.1 PREPARATION

- A. Verify that electric power is available and of the correct characteristics.

#### 3.2 INSTALLATION

- A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). See Section 23 31 00 for duct construction and pressure class.
- B. Coordinate fire/smoke damper requirements with Division 26 and Division 28.
- 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 for cleaning kitchen exhaust ducts in accordance with NFPA 96 Provide minimum 14 by 14 inch size access door for hand and shoulder access, or as indicated on drawings.
- D. For concealed balancing dampers only where damper is inaccessible, provide Young Regulator "Bowden" cable operated damper controller.
- E. Provide duct test holes where indicated and required for testing and balancing purposes.
- F. Provide fire dampers, combination fire and smoke dampers, and smoke dampers at locations indicated, where ducts and outlets pass through fire-rated components, and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.
- G. Install combination smoke and fire dampers in accordance with NFPA 92A.

- H. Demonstrate re-setting of fire dampers to Owner's representative.
- I. Provide balancing dampers at points on supply, return, outside air and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.
- J. 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 37 00  
AIR OUTLETS AND INLETS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Diffusers
- B. Registers/grilles
- C. Door grilles.
- D. Louvers:
- E. Gravity ventilators.

1.2 RELATED REQUIREMENTS

- A. Refer to the General Conditions, Special Conditions and Division 1 General Requirements. The requirements of these sections apply to this section.

1.3 REFERENCE STANDARDS

- A. AHRI 880 (I-P) - Performance Rating of Air Terminals; 2017 (Reaffirmed 2023).
- B. ADC 1062: GRD - Test Code for Grilles, Registers & Diffusers; Air Diffusion Council; 1984.
- C. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; 2023.
- D. AMCA 511 - Certified Ratings Program Product Rating Manual for Air Control Devices; 2021, with Editorial Revision (2022).
- E. AMCA 550 - Test Method for High Velocity Wind Driven Rain Resistant Louvers; 2022.
- F. ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Air Inlets; 2023.
- G. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.
- H. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.
- I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.

- J. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.
- K. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2024.
- L. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.
- M. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

#### 1.4 RELATED SECTIONS

- A. The Drawings and General Provisions of the Contract, including the General Conditions, Special Conditions and Division 1 General Requirements apply to this section.
- B. The Contract Agreement, Bidding Documents and all Addenda issued prior to Contract Agreement execution form a part of these specifications and apply to all Contracts or Subcontracts relating to the mechanical systems.
- C. The requirements of this Section apply to all Work of Division 23.

#### 1.5 SUBMITTALS

- A. See Division 1 specifications 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.
- C. Project Record Documents: Record actual locations of air outlets and inlets.

#### 1.6 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.
- C. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

### PART 2 PRODUCTS

#### 2.1 MANUFACTURERS

- A. Krueger-HVAC: [www.krueger-hvac.com/#sle](http://www.krueger-hvac.com/#sle).
- B. Price Industries: [www.price-hvac.com/#sle](http://www.price-hvac.com/#sle).
- C. Ruskin Company: [www.ruskin.com/#sle](http://www.ruskin.com/#sle).
- D. Titus, a brand of Air Distribution Technologies: [www.titus-hvac.com/#sle](http://www.titus-hvac.com/#sle).
- E. Tuttle and Bailey: [www.tuttleandbailey.com/#sle](http://www.tuttleandbailey.com/#sle).

## 2.2 **DIFFUSERS**

- A. Frame: Provide surface mount, snap-in, inverted T-bar, and spline type. In plaster ceilings, provide plaster frame and ceiling frame.
- B. Fabrication: Steel or aluminum with baked enamel finish.
- C. Color by Architect.
- D. Accessories: Provide radial opposed blade, butterfly, combination splitter, and volume control damper; removable core, sectorizing baffle, safety chain, wire guard, equalizing grid, operating rod extension, and gaskets for surface mounted diffusers with damper adjustable from diffuser face.
- E. SEE DRAWINGS FOR DIFFUSER SPECIFICATIONS.

## 2.3 **REGISTERS/GRILLES**

- A. Frame: Provide surface mount, snap-in, inverted T-bar, and spline type. In plaster ceilings, provide plaster frame and ceiling frame.
- B. Fabrication: Steel or aluminum with baked enamel finish.
- C. Color by Architect.
- D. Accessories: Provide radial opposed blade, butterfly, combination splitter, and volume control damper; removable core, sectorizing baffle, safety chain, wire guard, equalizing grid, operating rod extension, and gaskets for surface mounted diffusers with damper adjustable from diffuser face.
- E. SEE DRAWINGS FOR REGISTER/GRILLE SPECIFICATIONS.

## 2.4 **DOOR GRILLES**

- A. Type: V-shaped louvers of 20 gauge, 0.0359 inch thick steel, 1 inch deep on 1/2 inch centers.
- B. Frame: 20 gauge, 0.0359 inch steel with auxiliary frame to give finished appearance on both sides of door, with factory prime coat finish.

## 2.5 COMBINATION LOUVERS

- A. Damper-combined, drainable louver:
- B. Size: As indicated on the drawings.
- C. Material: Extruded aluminum.
- D. Paint Finish and Color: To be selected by Architect from manufacturer's full range.
- E. Sleeve or Flange: Factory-mounted standard.
- F. Linkage: Concealed in frame.

## 2.6 GRAVITY VENTILATORS

- A. Hood Intake and Relief Gravity Ventilator:
  - 1. Manufacturers:
    - a. Greenheck Fan Corporation: [www.greenheck.com/#sle](http://www.greenheck.com/#sle).
    - b. Loren Cook Company: [www.lorencook.com/#sle](http://www.lorencook.com/#sle).
  - 2. General:
    - a. Low silhouette for intake and relief applications with natural gravity or negative pressure system(s).
    - b. Performance ratings and factory testing in accordance with AMCA 511 and AMCA 550.
    - c. Suitable for non-ducted applications.
    - d. Equipment to bear permanently affixed manufacturer's nameplate listing model and serial number.
  - 3. Hood and Base:
    - a. Material: Aluminum.
    - b. Hood Construction: Precision formed, arched panels with interlocking seams.
    - c. Vertical End Panels: Fully locked into hood end panels.
  - 4. Birdscreen:
    - a. Fabricate in accordance with ASTM B221 (ASTM B221M).

- b. Construction: 1/2 inch Galvanized mesh.
- c. Horizontally mounted across hood intake area.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Comply with SMACNA (ASMM) for flashing/counter-flashing of roof penetrations and supports for roof curbs and roof mounted equipment.
- C. Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.
- D. Install diffusers to ductwork with air tight connection.
- E. Provide balancing dampers on duct take-off to diffusers and grilles and registers, despite whether dampers are specified as part of diffuser, or grille and register assembly.
- F. Paint ductwork visible behind air outlets and inlets matte black.

END OF SECTION



SECTION 26 05 00  
COMMON WORK RESULTS FOR ELECTRICAL

**PART 1 - GENERAL**

1.01 CONTRACT PROVISIONS

- A. The requirements of this Section are in addition to the requirements of Division 1, General Conditions and Supplementary Conditions.

1.02 SUMMARY

- A. This section describes the requirements for the electrical work includes, among others, the furnishing and installation of the following:
  - 1. Power distribution system.
  - 2. Grounding system.
  - 3. Lighting and lighting control systems.
  - 4. Wiring systems including power wiring to plumbing and HVAC and other misc. appliances and equipment.
  - 5. Electrical services (power) for Communications management system. (voice/video/media/clock) as described in Division 27 and as indicated on the drawings.
  - 6. Electrical services (power) for Computer data systems, as described in Division 28 and as indicated on the drawings to include outlets, raceways, and cabling.
  - 7. Electrical services (power) for Intrusion alarm and security systems as described in Division 28 and as indicated on the drawings.
  - 8. Emergency egress lighting.
- B. Furnish and install all electrical equipment and systems as shown on the Drawings and as described in this Division of the Specifications to provide a complete and functional electrical installation. This work includes but is not limited to all material and labor required for installation of electrical and special systems complete as described herein this specification and drawings; and connections (and installation where not otherwise provided for) of electrical equipment furnished by others. Provide and install all items of equipment, devices, supports, etc., which are incidental to the major components shown on the Drawings or described in these Specifications.

1.03 DEFINITIONS

- A. The meaning of words shall be as defined in the CEC Article 100, Definitions, unless defined otherwise in an individual specification section.
- B. The following specification development organizations are referenced throughout the various specification sections of Division 26:
  - 1. ADAAG – Americans with Disabilities Act Accessibility Guidelines.
  - 2. ANSI – American National Standards Institute.
  - 3. AQMD – Air Quality Management District.
  - 4. ASME – American Society of Mechanical Engineers.
  - 5. ASTM – American Society for Testing and Materials.
  - 6. FCC – Federal Communications Commission.
  - 7. ICC - International Code Council
  - 8. 21. IEEE – Institute of Electrical and Electronic Engineers.
  - 9. ISO – International Organization for Standardization.
  - 10. 27. NECA – National Electrical Contractors Association.
  - 11. 28. NEMA – National Electrical Manufacturing Association.
  - 12. 29. NETA – National Electrical Testing Association.
  - 13. 30. NFPA – National Fire Protection Association.
  - 14. 32. OSHA – Occupational Safety and Health Administration.
  - 15. 34. UL – Underwriters Laboratories.

1.04 RELATED WORK INCLUDED IN OTHER DIVISIONS

- A. Finish painting except factory applied finishes and repair of factory finishes shall be provided in accordance with appropriate sections of this Specification. Coordinate "painting" requirements of this Division with other trades as required to assure timely and satisfactory completion of required work. In finished areas, all exposed raceway, boxes, galvanized steel box covers (where allowed), and other electrical "structure" shall be finished to match adjacent structures. Verify that all raceway

openings are closed and box covers are in place prior to finishing work done by others.

- B. Examine the drawings and specification for mechanical and plumbing equipment and provide electrical installation for heating, ventilation and air conditioning equipment, motors, pumps and associated motor starters and controls as described in Division 23.
- C. Examine the Architectural drawings and specification for electrical appliances and equipment which may not be shown on the plans to include and provide electrical installations as described in the architectural division of work.
- D. Examine the Architectural drawings and provide all construction necessary to maintain the integrity of the fire rated barriers.
- E. Examine the Architectural drawings and coordinate with the Architect to provide access doors, whether shown on drawings or not, where floors, walls, or ceiling must be penetrated for access to electrical equipment, outlet boxes, devices, etc., and as specified in this specification.
- F. Provide and install, as part of the work described in this Division, all power and control wiring fed from a source of 30 Volts or more (i.e. all wiring except temperature control wiring) for mechanical equipment described in Division 23.

#### 1.05 APPLICATION OF OTHER DIVISIONS

- A. Where carpentry, masonry, concrete work, painting, etc., is required in the installation of equipment specified under this Division, the work shall be done in accordance with the applicable Division of these Specifications. This work could include for example: work associated with panelboard installation, equipment pads or bases, support structures, etc.

#### 1.06 DRAWINGS AND SPECIFICATIONS

- A. The information presented in these Specifications, and on the drawings, is intended to describe the utilitarian and physical aspects of the systems shown as well as the quality of the entire installation. All information is as complete and thorough as possible, but every condition or situation cannot be anticipated. Exact locations, dimensions, elevations, etc. must be determined "on the job" with careful attention to the "intent" of the Drawings and Specifications.
- B. The above paragraph shall not be construed as to allow significant deviation from either the Drawings or Specifications without prior approval of the Architect, but minor changes in conduit routing or equipment locations may be required or

desired due to specific conditions encountered. This work shall be accomplished in accordance with these Specifications and no "extra charges" are to be created for any unanticipated labor or material.

- C. Any error or omissions of detail in either the drawings or the specifications shall not relieve the Contractor from correctly installing all materials necessary for complete and operating electrical systems.
- D. Contractor shall inspect the site and verify all measurements and conditions. No extra compensation will be allowed because of differences between work shown on the drawings and measurements at the site.
  - 1. The Drawings are diagrammatic in nature, but the locations of devices, equipment, outlets, and lighting fixtures are shown approximately where installations are intended. Architectural, structural, mechanical, audio/video, theatrical lighting and other drawings shall be examined, noting all conditions that may affect this work. Report conflicting conditions to the Architect/Engineer for adjustment before proceeding with the work. Should the Contractor proceed with work without reporting the matter, he does so on his own responsibility and shall alter work if directed by the Architect/Engineer at his own expense.
- E. Examine the architectural, structural, mechanical, fire sprinkler and manufacturer's drawings for various equipment in order to determine exact routing and final terminations for all conduits and cables. Conduits shall be stubbed up as near as possible to equipment enclosure.
- F. All equipment shall be located and installed so that it will be readily accessible for operation and maintenance. The Owner reserves the right to require minor changes in location of outlets or equipment, prior to rough in without incurring any additional cost or changes.
- G. If significant departures from the Drawings or Specifications are considered necessary by the Contractor, details of the changes and the reasons therefore shall be submitted to the Architect as within thirty days after award of contract. Prior written acceptance of the Architect is required for these departures.
- H. Clarification of plans and specifications for the purpose of facilitating construction, but not involving additional labor and materials, may be prepared during construction by the Architect/Engineer. Said revised plans and specifications shall become a part of the contract. The Contractor shall conform to the revised plans and specifications at no additional cost to the Owner.

1.07 CODES, STANDARDS, RULES AND REGULATIONS

- A. All work and materials shall be in full accordance with the latest rules, codes, and/or regulations and not limited to the following:
- B. California Building Standards Code (California Code of Regulations - Title 24)
- C. NFPA 70 - National Electrical Code; National Fire Protection Association, 2020 with 2025 California Electrical Code amendments
- D. NFPA 72 - Fire Alarm Code
- E. NFPA 101 - Life Safety Code
- F. City and County Electrical Codes as applicable.
- G. Utility rules and regulations.
- H. Any applicable additional codes and regulatory documents effective at the project site.
- I. Nothing on the Drawings or in the Specifications shall be construed to allow work not in conformance with these rules, codes, and regulations.
  - 1. The Drawings and/or Specifications shall take precedence where work and material described therein exceeds that required by rules, codes, or regulations.

1.08 MANUFACTURER'S INSTRUCTIONS

- A. Follow the manufacturer's instructions when specific installation or connection details are not indicated or specified on the contract documents.
- B. Notify the Architect/Engineer of conflicts between the manufacturer's instructions and installation or connection details prior to the installation of materials.

1.09 WORKMANSHIP

- A. High quality workmanship shall be evidenced in the installation of all electrical equipment and materials. Use the National Electrical Contractors Association's "Standard of Installation" as a guide to the workmanship required. Be prepared to replace or repair any material or equipment damaged by or installed in a manner exhibiting evidence of poor workmanship.

1.10 COORDINATION WITH OTHER TRADES

- A. Examine the Electrical Drawings and refer to the Drawings and Specifications describing other work to be accomplished. Verify and coordinate prior to bid. Continue to coordinate work planning and all work in the field to avoid conflicts, errors, and/or delays. No compensation will be allowed for extra work necessitated by lack of coordination.

1.11 AUTHORITY OF THE ARCHITECT

- A. As used in this paragraph only, the word "Architect" shall mean the Architect of record or his designated representative.
- B. The authority of the Architect shall be absolute with respect to all performance under this Specification. In case of dispute, the decision of the Architect shall be final.
- C. Where optional materials, methods, or installation techniques are allowed under the provisions of this Specification, they may be used at the discretion of the Architect. The Architect may require specific materials, methods, or techniques to be used in specific situations where use of other materials, methods, or techniques might in his judgment result in loss of aesthetics, accidental damage, life safety hazard, or loss of utility over the system design lifetime.
- D. No additional charges will be allowed for work or material require to be supplied under the conditions of this paragraph unless the need for such material or work could not have been anticipated by thorough study of the site, Drawings, and Specifications and knowledge of all applicable codes, laws, and ordinances.

1.12 EXAMINATION OF THE SITE

- A. The contractor is required to visit the site of construction prior to bid to determine existing conditions and their effect upon the work he will be required to perform. No additional compensation will be allowed for any extra expenses incurred by failure to detect and evaluate all existing conditions that will affect his work to be included in the bid to accomplish this contract document's goal.

1.13 STRUCTURAL REQUIREMENTS

- A. Secure all anchors for electrical equipment in a manner, which will not decrease the structural value of any structure to an unsafe level. Install all equipment, fixtures, etc. to resist seismic movements. Inform the Architect in advance and provide drawings of any proposed modifications to the structure that involves cutting or patching of concrete, masonry, steel, or wood in this project.

1.14 PERMITS, FEES, AND, INSPECTIONS

- A. Obtain all permits and licenses as required and pay all fees incidental to construction.
- B. Inspections required by prevailing Local Authorities, and/or ordinances, shall be coordinated and arranged by the contractor. Provide the Architect with a schedule of inspections, where applicable, and submit all certificates of inspection to the Architect.
- C. The Contractor shall cooperate with the Architect and shall provide assistance at all times for the inspection of the electrical work. Remove covers, operate equipment, or perform any reasonable work, which, in the opinion of the Architect, will be necessary to determine the quality or adequacy of the work. Work shall not be closed in or covered before inspection and approval by the Architect. Cost of uncovering and making repairs where un-inspected work has been closed in shall be borne by the Contractor. If any material does not conform with these specifications the Contractor shall, within three days after being notified by the Architect, remove the materials from the premises.

1.15 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials and equipment to project site in manufacturer's original packaging with labeling showing product name, brand, model, project name, address, and Contractor's name. Store in a location as agreeable to the Owner. Secure material from weather or accidental damage.

1.16 OPERATING INSTRUCTIONS

- A. Instruct the Owner as to function, operation, maintenance, and adjustment of each system and piece of equipment provided.

1.17 RECORD DRAWING

- A. The Contractor shall keep a separate set of Electrical Drawings at the job site to be used as RECORD Drawings. These Drawings are to be kept current and in a neat and clean condition at all times. They are to be available for inspection by the Architect or Engineer at any time during site visitations. These Drawings shall be "red lined" to indicate all changes in equipment, device, and outlet locations; and to indicate the true locations of all concealed or underground work where different from that shown on the Drawings. Each sheet of this set shall be clearly and permanently marked "RECORD DRAWINGS".
- B. Upon completion of the project and prior to final payment, transfer all RECORD DRAWINGS information to the provided original drawings. All information shall be

clearly drawn with "RED" ink. The drawings shall be scanned, 100% edited, and converted into an AutoCAD ".dwg" version 2011 (or higher) electronic file. Deliver the original, final sets, and electronic files (CD) to the Architect for review and delivery to the Owner.

**1.18 SPARE PARTS**

- A. Spare parts shall be provided and maintained by the Contractor to support the maintenance response requirements defined in this document.
- B. At a minimum, the following spare parts shall be stored onsite at a location identified by the Owner's representative. The spare parts shall be the property of the Owner. The spare parts shall be of the same type submitted and installed in the facility to include the following:
- C. Lighting fixture LED driver, one for each fixture type.
- D. Branch circuit panelboard circuit breaker, one for each circuit breaker type.
- E. Fuses, one set of three for each fuse type and size.
- F. Lighting occupancy sensors and switches, one for each sensor and switch type.

**1.19 GUARANTEE**

- A. All electrical work, material, and equipment shall be guaranteed to be free from defects in workmanship or material for a period of two (2) year from the date of final acceptance. Repair or replace all such defects in a timely manner and any damage to the owner's property resulting from such defect or repair thereof. All equipment and material provided and all work accomplished under the requirements of this section shall be at no expense to the Owner.

**PART 2 - PRODUCTS**

**2.01 MATERIALS**

- A. Unless specifically indicated otherwise, all material shall be new and free from defects; it shall be listed by Underwriters' Laboratories where applicable. Like items shall be of the same manufacturer (except lighting fixtures - which shall be as specified).
- B. Except as noted otherwise, where material of a particular manufacturer is specified, the intent is to describe the quality and function of the item. The term "...or acceptable equal" is implied. A substitution of any of these items will require that

the item be presented in a submittal whether specifically listed in the "Submittals" paragraph below or not.

## 2.02 SUBMITTALS

- A. Material submittals shall be complete and submitted all at the same time. The individual groups of submittal types (e.g.: lighting fixtures, wiring devices, distribution equipment, etc.) MUST be prefaced with a list of contents identifying each item by its project name or symbol, manufacturer, and complete catalog number. Each copy of each submittal group shall have the list of contents attached. These lists will be used to report submittal comments. The Contractor is responsible for submitting this information in a timely manner so that material may be ordered early enough to meet the construction schedule. If material is not ordered in time for whatever reason, pay such premium prices and special handling charges as are required to meet the construction schedule. No substitution of an "accepted" item will be allowed due to failure to plan for adequate material procurement lead time.
- B. Shop drawings shall be drawn to scale or completely dimensioned and shall give all information required to completely describe the item. The Contractor shall carefully check all the shop drawings for compliance with these specifications and the Plans.
- C. If the shop drawings show variations from the Contract requirements because of standard shop practice or other reasons, the Contractor shall make specific mention of such variations in order that if (acceptable) suitable action may be taken for proper adjustment of the Contract. The Contractor will not be relieved of the responsibility for executing the work in accordance with the Contract, even though the shop drawings have been reviewed.
- D. Work requiring shop drawings shall not be started before receipt of the Architect's review and acceptance.
- E. The Architect's/Engineer's review of the submitted materials, items and shop drawings are for general compliance with the plans and specifications and general design and arrangement only. Therefore, it shall not relieve the Contractor from responsibility for errors of any sort in the materials, items, shop drawings or schedules. The Contractor shall verify all dimensions and job site conditions affecting the work, and shall be responsible for furnishing and installing the proper materials required by the Contract, whether or not indicated on the drawings and specifications.
- F. As a minimum, submittals are required for the following items:
  - 1. RACEWAY COMPONENTS

2. WIRE AND CABLE
3. WIRING DEVICES
4. SAFETY SWITCHES, DISCONNECTS AND CIRCUIT BREAKERS
5. LIGHTING FIXTURES, CONTROL SYSTEMS, PEDESTALS AND POLES

#### 2.03 SUBSTITUTIONS

- A. Specific brand names and catalog numbers are used to describe materials in order to establish of performance and quality.
- B. Only one substitution will be considered for any item. Substitute materials must be equal in quality and function to that specified. Allowance of a substitution does not permit any reduction of system performance or utility, and the Contractor is responsible for additional costs incurred due to use of a substituted item. If the proposed substitute item is "rejected", the specified item shall be provided (re-submittal required) without further discussions or delay.
- C. Any Contractor's proposed substitution of material, article, or method in the opinion of the Architect/Engineer are equal to that specified will be accepted, provided the Contractor submits a single written request, in triplicate, to the Architect, with the following information for each item:
  - D. Name of Manufacturer or supplier.
  - E. Trade or brand names.
  - F. Type, model, style, and/or catalog number.
  - G. Size or capacity rating.
- H. After receipt of a written request from the contractor, the engineer of record will review product substitutions fourteen (14) days prior to the bid date. If system substitutions are submitted after the award of the project contract, the analysis for the whole system substitution will be charged to the contractor at senior engineer hourly rates.
- I. The decision of the Architect/Engineer shall govern as to what is equal to the item specified in the plans and specifications. Equality will be judge on the basis of the following:
  1. Conformance with description or performance required.

2. Equal in quality.
  3. Comparable in appearance and artistic effect where these are in considerations.
  4. Comparable operation, maintenance and performance.
  5. Equal in longevity and service under conditions of climate and usage.
  6. Conformance with space allocations and requirements for operations from in details and construction of related work.
  7. Conformance with all applicable codes and regulations.
- J. If the Architect/Engineer considers it necessary, tests to determine the quality of the proposed materials shall be made, at the expense of the Contractor, by an unbiased laboratory, satisfactory to the Architect.

#### 2.04 ENCLOSURES

- A. Provide enclosures suitable for the specific type of location in which they are installed.
1. Provide NEMA 1 or NEMA 12 boxes and enclosures for dry locations. Dry locations are all indoor areas that do not fall within the definitions below for wet or damp locations.

### **PART 3 - EXECUTION**

#### 3.01 INSTALLATION

- A. All equipment shall be set square and plumb, securely mounted, adequately supported, and permanent. Provide workspace around items of electrical equipment as required by California Electrical Code (CEC). In general, equipment is to be installed in accordance with manufacturer's instructions; but the requirements of these specifications shall take precedence where conflicts exist.
- B. WIRING METHODS: The cables and conductors of all systems specified in the Specification are required to be installed in raceway.
- C. Coordinate electrical work with the Owner's representative and work of other trades to avoid conflicts, errors, delays, and unnecessary interference with operation of the facility during construction.
- D. Check and coordinate the approximate locations of electrical stub-ups, light fixtures, electrical outlets, equipment, and other electrical system components shown on the

Drawings for conflicts with openings, structural members, and components of other systems and equipment having fixed locations. In the event of conflicts, notify the architect in writing. The architect's decision shall govern. Make modifications and changes required to correct conflicts as required.

### 3.02 ELECTRICAL WORK FOR EQUIPMENT PROVIDED UNDER OTHER SECTIONS

- A. Install power conductors and terminate on equipment provided under other specification sections. Verify specific requirements.
- B. Install and terminate electrical controls as described on the Electrical Drawings (For mechanical equipment specified in Division 23).
- C. Line voltage control wiring of exhaust fans is to be accomplished under this Division. The controlling device may be specified elsewhere.
- D. Provide and install all disconnect/safety switches and motor starters except those devices specified to be furnished with equipment specified elsewhere.
- E. Unless provided for in another Division, install all items of electrical equipment provided by others.
- F. Assist others in equipment testing to verify that wiring and connections made under this Division are correct.

### 3.03 EQUIPMENT IDENTIFICATION

- A. Nameplates shall be installed on all items of electrical equipment as follows: switchboard(s) and switchboard circuit breakers, panelboards, terminal cabinets, time switches, contactors, motor control switches, wall switches (where noted on the Drawings), motor starters provided under this Division where the function is not immediately obvious, and safety switches.
- B. The nameplate shall identify the item by Drawing name where applicable and describe its use or function in this installation.
- C. Permanently mark all utility outlets to show source of power panel and circuit breaker number.
- D. Provide nameplates per Section 26 05 53.

### 3.04 SEALING PENETRATIONS

- A. Flash and counter flash roof and wall penetrations with equipment manufactured for the purpose and as described in other Divisions of these Specifications or as Directed by the Architect. Apply mastic as required to seal absolutely watertight.
- B. Conduits penetrating floor slabs or block or concrete walls shall be grouted and sealed watertight.

3.05 CUTTING AND PATCHING

- A. Obtain the Architect's acceptance prior to cutting existing surfaces or surfaces under construction. All such surfaces must be repaired or patched to the satisfaction of the Architect.

3.06 EQUIPMENT ANCHORING

- A. Seismic Withstand Requirements: Freestanding or wall-hung equipment shall be anchored in place by methods, which will meet the requirements of the applicable codes for seismic loads. The contractor shall submit calculations in accordance with "Contractor Submittals", for the design of the anchoring systems for all equipment, including panels, transformers, etc. in excess of 250 pounds. Calculations shall be performed, signed and stamped by a Structural Engineer or a Civil Engineer experienced in structural design and licensed in the State of California. The calculation shall provide an analysis of lateral and overturning forces and shall include a factor of safety against overturning equal to 1.5. The calculation shall also provide an analysis of both the anchoring system and the foundation or wall system to receive the anchor loads and shall show that the foundation is capable of resisting all anchor loads. Submittal shall include data on attachment hardware and methods that will satisfy withstand criteria.
- B. Seismic bracing for light fixtures cable or pendant suspended from ceiling or roof structure shall be seismically braced to prevent fixture from swaying 45 degree in either direction of suspension point. Contractor shall use same cable used to suspend light fixture. Where pendants are use the contractor shall use air craft light fixture suspension cable. Submittal shall include data on attachment hardware and methods that will satisfy withstand criteria referred to in above paragraph.

3.07 PROTECTION CLEANING AND REPAIRS

- A. All electrical equipment shall be protected from damage or degradation during construction. Electrical equipment stored or installed shall be protected from dust, water, or damage from other sources.

- B. After all other work has been accomplished, such as plastering, painting, etc., and prior to final review by the Architect; all electrical equipment, especially equipment enclosures, panelboards, switchboards, and lighting fixtures shall be thoroughly cleaned (inside and out) of all dirt, water, grease, plaster, paint, or other construction debris. All surfaces shall be clean and in "new" condition. All scratches, dents, marks, cracks, etc., shall be repaired to the satisfaction of the Architect or the equipment shall be replaced at no additional cost.

### 3.08 ELECTRICAL EQUIPMENT DELIVERABLES

- A. Retain and safeguard all detachable and spare devices, equipment, and literature (O&M manuals, instruction books, wiring diagrams, test reports, keys, fixtures, etc.) until completion of work. At this time, all items will be delivered to the Owner as directed by the Architect.

### 3.09 TESTS

- A. Take precaution during the testing period to insure the safety of personnel and equipment.
- B. Test all wiring for continuity and grounds before any fixtures or equipment are connected. Where such tests indicate faulty installation or other defects, the fault(s) shall be located and repaired at the Contractor's expense. The repaired installation shall then be retested.
- C. Verify rotation of all three phase motors and reconnect if necessary.
- D. Verify the resistance of the grounding electrode system(s).
- E. Balance all loads on each panelboard and all other types of distribution equipment as applicable.

### 3.10 ADJUSTING

- A. Inspect all equipment and put into good working order.

### 3.11 CLEANING

- A. Clean work under provisions of Division 1.
- B. Clean all electrical items. Fixtures and equipment shall be free of dirt, dust and other construction debris.

### 3.12 START UP

- A. Operate all electrical systems in good working order for a period of five consecutive days at a time period agreed to by the Owner's representative.

END OF SECTION



SECTION 26 05 05  
SELECTIVE DEMOLITION FOR ELECTRICAL

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Electrical demolition.

1.02 RELATED REQUIREMENTS

- A. Section 01 70 00 - Execution and Closeout Requirements: Additional requirements for alterations work.
- B. Section 26 05 00-Common Work Results for Electrical.

1.03 SUBMITTALS

- A. See Section 01 33 00 for submittal procedures.
- B. Sustainable Design Documentation: Submit certification of removal and appropriate disposal of abandoned cables containing lead stabilizers.

1.04 REQUIREMENTS INCLUDED

- A. The Contractor shall furnish materials, equipment, and labor necessary to perform and complete demolition work.
- B. The work includes demolition of the existing electrical system and equipment.
- C. The work shall include, but not limited to. Removal of existing electrical equipment and devices, conduits, and wiring.
- D. Manufactured articles, materials, equipment, and accessories shall be demolished in accordance with the manufacturer's specifications and recommendations, and industry standards.
- E. Notify the Owner's Representative at least 72 hours prior to any electrical systems shutdown and receive approval prior to proceeding.

1.05 PROTECTION

- A. It is essential that there be minimal interruption of existing systems such as power, fire protection, and other systems, in addition to the normal operations of the Owner's facilities.

- B. Take care to ensure that there will be no damage to structural elements or portions there-of-which are not to be removed. Erect and maintain temporary shoring, bracing and other means to safeguard the structural integrity of the existing building(s) and structures.
- C. Erect and maintain temporary bracing, shoring, lights, barricades, signs, and other means to protect the public, workers, and other persons; finishes, and improvements to remain; and adjoining property from damage from demolition work; all in accordance with applicable regulatory requirements.
- D. Protect existing structures, facilities, and plant life from damage. Items damaged as a result of demolition operations shall be repaired or replaced, at no cost to the Owner.
- E. Perform demolition to provide the least interference and most protection to existing facilities and improvements to remain.
- F. Demolish concrete in small sections.
- G. Perform demolition as much as possible with small tools.
- H. Jackhammering:
  - 1. Jackhammering will be permitted only to a limited degree, and only with the prior written approval of the Owner.
  - 2. Do not jackhammer within 2-inches of reinforcing or structural steel to remain; remove final 2-inches of material with chipping gun.

#### 1.06 CUTTING AND PATCHING

- A. Make new openings neat, as close as possible to profiles indicated, and only to extent necessary for new work.
- B. Do not cut or alter structural members unless specifically indicated or approved, and do not damage reinforcing or structural steel to remain.
- C. At concrete, masonry, paving, and other materials where edges of cuts and holes will remain exposed in the completed work, make cuts using power-sawing and coring equipment. Do not over cut at corners of cut openings – saw overruns will not be permitted. Core hole at corner of proposed openings to insert blade and chip square.
- D. Upon completion of cutting and coring, clean remaining surfaces of loose particles and dust.

- E. Repair and patch all holes and openings from the removed electrical equipment, outlet boxes, etc.: Coordinate with the General Contractor and Architect to include and provide finishes to match adjacent surfaces.

#### 1.07 PIPES, DUCTS AND CONDUITS

- A. Remove deactivated electrical conduits, including fasteners, connections, and other related appurtenances and accessories which would otherwise be exposed in the completed work or interfere with construction operations.
- B. Unless noted otherwise, remove existing exposed conduits and abandon existing concealed conduits in walls, ceilings and underground whether shown on drawings or not.
- C. Cap deactivated piping systems at point of cutoff.

#### 1.08 DEMOLITION DEBRIS

- A. All demolished equipment and associated materials must be disposed of in an approved manner and in accordance with all applicable federal, state and local laws.
- B. Regularly remove debris from the site so that it's presence will not delay the progress of the work.
- C. Nothing removed from the site shall be stored, sold, or burned on site without the Owner's prior written acceptance.

#### 1.09 RECONDITIONING EXISTING SUBSTRATES

- A. Clean surfaces on which new materials will be applied, removing adhesives, bitumen, and other adhering materials, as necessary to furnish acceptable substrates for new materials.
- B. Perform sandblasting, chipping, grinding, acid washing, etching, and other work as required by conditions encountered and new materials involved.
- C. Use of acids or other cleaning agents shall include neutralizing, washing, rinsing, and drying, as applicable.
- D. Determine substrate requirements for reconditioned surfaces in cooperation with the manufacturer's representative and installer of each new installer involved.

#### 1.10 DISPOSAL OF FLUORESCENT LAMPS AND BALLASTS

- A. All existing fluorescent lamps and ballasts shall be properly disposed or recycled according to the Environmental Protection Agency (EPA) and Resource Conservation and Recovery Act (RCTA) standards. Include all costs for disposal or recycling in the bid proposal.
  - 1. Lamps: Dispose or recycle through "Allied Technology Group", 47375 Freemont Blvd., Freemont, CA, 94538, (510) 490-3008 or equal.
  - 2. Ballasts: Dispose or recycle through "Fulcircle Ballast Recyclers", 550 Montori Court, Pleasanton, CA, 94556, (510) 417-5967 or equal.

1.11 ASBESTOS

- A. In the event asbestos is found to be present in areas conflicting with electrical work, before continuation of work in these areas, notify the General Contractor and/or Owner's Representative and if applicable, for the removal of such hazardous material by a certified asbestos contractor.

**PART 2 PRODUCTS**

2.01 MATERIALS AND EQUIPMENT

- A. Materials and equipment for patching and extending work: As specified in individual sections.

**PART 3 EXECUTION**

3.01 EXAMINATION

- A. Verify field measurements and circuiting arrangements are as indicated.
- B. Verify that abandoned wiring and equipment serve only abandoned facilities.
- C. Demolition drawings are based on field observation and existing record documents.
- D. Report discrepancies to Architect and Owner before disturbing existing installation.
- E. Beginning of demolition means installer accepts existing conditions.

3.02 PREPARATION

- A. Disconnect electrical systems in walls, floors, and ceilings to be removed.
- B. Coordinate utility service outages with utility company.

- C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.
- D. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.
  - 1. Obtain permission from Owner Representative at least 24 hours and receive approval before partially or completely disabling system.
  - 2. Make temporary connections to maintain service in areas adjacent to work area.

### 3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- A. Perform work for removal and disposal of equipment and materials containing toxic substances regulated under the Federal Toxic Substances Control Act (TSCA) in accordance with applicable federal, state, and local regulations. Applicable equipment and materials include, but are not limited to:
  - 1. PCB-containing electrical equipment, including transformers, capacitors, and switches.
  - 2. PCB- and DEHP-containing lighting ballasts.
  - 3. Mercury-containing lamps and tubes, including fluorescent lamps, high intensity discharge (HID), arc lamps, ultra-violet, high pressure sodium, mercury vapor, ignitron tubes, neon, and incandescent.
- B. Remove, relocate, and extend existing installations to accommodate new construction.
- C. Remove abandoned wiring to source of supply.
- D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
- E. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.
- F. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

- G. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.
- H. Repair adjacent construction and finishes damaged during demolition and extension work.
- I. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.
- J. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

#### 3.04 CLEANING AND REPAIR

- A. Clean and repair existing materials and equipment that remain or that are to be reused.
- B. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.
- C. Luminaires: Remove existing luminaires for cleaning. Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry. Replace lamps, ballasts and broken electrical parts.

END OF SECTION

SECTION 26 05 19  
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Single conductor building wire.
- B. Wiring connectors.
- C. Electrical tape.
- D. Heat shrink tubing.
- E. Oxide inhibiting compound.
- F. Wire pulling lubricant.
- G. Cable ties.
- H. Firestop sleeves.

1.02 RELATED REQUIREMENTS

- A. Section 07 92 00 Joint .
- B. Section 26 05 05 - Selective Demolition for Electrical: Disconnection, removal, and/or extension of existing electrical conductors and cables.
- C. Section 26 05 26 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.
- D. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- E. Section 28 46 00 - Fire Detection and Alarm: Fire alarm system conductors and cables.

1.03 REFERENCE STANDARDS

- A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2018).
- B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2023.

- C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010, with Editorial Revision (2020).
- D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2020).
- E. ASTM B800 - Standard Specification for 8000 Series Aluminum Alloy Wire for Electrical Purposes - Annealed and Intermediate Tempers; 2005 (Reapproved 2021).
- F. ASTM B801 - Standard Specification for Concentric-Lay-Stranded Conductors of 8000 Series Aluminum Alloy for Subsequent Covering or Insulation; 2018 (Reapproved 2023).
- G. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2017.
- H. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes; 2020.
- I. FS A-A-59544 - Cable and Wire, Electrical (Power, Fixed Installation); 2008a (Validated 2019).
- J. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- K. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2021.
- L. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.
- M. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- N. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.
- O. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.
- P. UL 267 - Outline of Investigation for Wire-Pulling Compounds; Current Edition, Including All Revisions.
- Q. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.
- R. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.

- S. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.
- T. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.

#### 1.04 ADMINISTRATIVE REQUIREMENTS

##### A. Coordination:

1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
3. Notify Electrical Engineer of Record of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

#### 1.05 SUBMITTALS

- A. See Section 01 33 00, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.
- C. Sustainable Design Documentation: Submit manufacturer's product data on conductor and cable showing compliance with specified lead content requirements.
- D. Design Data: Indicate voltage drop and ampacity calculations for aluminum conductors substituted for copper conductors. Include proposed modifications to raceways, boxes, wiring gutters, enclosures, etc. to accommodate substituted conductors.
- E. Field Quality Control Test Reports.
- F. 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.
- G. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.

#### 1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. All wire and cable shall comply with applicable standards of the Underwriters Laboratories Inc.
- C. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- D. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

#### 1.08 FIELD CONDITIONS

- A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F, unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify the Electrical Engineer or Record and obtain direction before proceeding with work.

#### 1.09 PROJECT CONDITIONS

- A. Existing Conditions
  1. Wire and cable routing shown on the Drawings is approximate unless dimensioned. Route wire and cable as required to meet project conditions.
  2. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.

- B. Verify that field measurements are as shown or indicated on the Drawings.

## **PART 2 PRODUCTS**

### **2.01 CONDUCTOR AND CABLE APPLICATIONS**

- A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
- C. Manufactured wiring systems are not permitted.
- D. Concealed Dry Interior Locations: Use only building wire in raceway.
- E. Exposed Dry Interior Locations: Use only building wire in raceway.
- F. Above Accessible Ceilings: Use only building wire in raceway.
- G. Wet or Damp Interior Locations: Use only building wire in raceway.
- H. Use solid conductor for feeders and branch circuits 10 AWG and smaller.
- I. Use stranded conductors for control circuits.
- J. Use conductor not smaller than 12 AWG for power and lighting circuits.
- K. Use conductor not smaller than 14 AWG for control circuits.
- L. Use 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 75 feet.
- M. Use 10 AWG conductors for 20 ampere, 277 volt branch circuits longer than 150 feet.
- N. Conductor sizes are based on copper unless indicated as aluminum or "AL".

### **2.02 WIRE MANUFACTURERS (LISTED IN ALPHABETICALLY ORDER ONLY AND NOT NECESSARY BY PREFERENCE)**

- 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).
- D. Substitutions: See Section 01 60 00 - Product Requirements.

## 2.03 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Provide conductors and cables with lead content less than 300 parts per million.
- D. Provide new conductors and cables manufactured not more than one year prior to installation.
- E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- F. Comply with NEMA WC 70.
- G. Comply with FS A-A-59544 where applicable.
- H. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- I. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
- J. Conductors for Grounding and Bonding: Also comply with Section 26 05 26.
- K. Conductors and Cables Installed in Cable Tray: Listed and labeled as suitable for cable tray use.
- L. Conductors and Cables Installed Where Exposed to Direct Rays of Sun: Listed and labeled as sunlight resistant.
- M. Conductors and Cables Installed Exposed in Spaces Used for Environmental Air (only where specifically permitted): Plenum rated, listed and labeled as suitable for use in return air plenums.
- N. 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/B787M unless otherwise indicated.

3. Tinned Copper Conductors: Comply with ASTM B33.

O. Minimum Conductor Size:

1. Branch Circuits: 12 AWG.

a. Exceptions:

1) 20 A, 120 V circuits longer than 75 feet: 10 AWG, for voltage drop.

2) 20 A, 120 V circuits longer than 150 feet: 8 AWG, for voltage drop.

3) 20 A, 277 V circuits longer than 150 feet: 10 AWG, for voltage drop.

2. Control Circuits: 14 AWG.

P. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

Q. 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.
- d. Isolated Ground, All Systems: Green with yellow stripe.
- e. Travelers for 3-Way and 4-Way Switching: Pink.
- f. For modifications or additions to existing wiring systems, comply with existing color code when existing code complies with NFPA 70 and is approved by the authority having jurisdiction.
- g. For control circuits, comply with manufacturer's recommended color code.

## 2.04 SINGLE CONDUCTOR BUILDING WIRE

### A. Manufacturers:

#### 1. Copper Building Wire:

- a. Cerro Wire LLC: [www.cerrowire.com/#sle](http://www.cerrowire.com/#sle).
- b. Encore Wire Corporation: [www.encorewire.com/#sle](http://www.encorewire.com/#sle).
- c. General Cable Technologies Corporation: [www.generalcable.com/#sle](http://www.generalcable.com/#sle).
- d. Service Wire Co: [www.servicewire.com/#sle](http://www.servicewire.com/#sle).
- e. Southwire Company: [www.southwire.com/#sle](http://www.southwire.com/#sle).
- f. Substitutions: See Section 01 60 00 - Product Requirements.

### B. Description: Single conductor insulated wire.

### C. Conductor Stranding:

#### 1. Feeders and Branch Circuits:

- a. Size 10 AWG and Smaller: Solid.
- b. Size 8 AWG and Larger: Stranded.

#### 2. Control Circuits: Stranded.

### D. Insulation Voltage Rating: 600 V.

## E. Insulation:

1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2.
  - a. Size 4 AWG and Larger: Type XHHW-2 or THHN/THWN.
  - b. Installed Underground: Type XHHW-2 or THHN/THWN.
  - c. Fixture Wiring Within Luminaires: Type TFFN/TFN for luminaires with labeled maximum temperature of 90 degrees C; Approved suitable type for luminaires with labeled maximum temperature greater than 90 degrees C.

## F. Conductor: Copper.

1. For Sizes Smaller Than 4 AWG: Copper.
2. For Sizes 4 AWG and Larger: Copper.

## G. Insulation Voltage Rating: 600 volts.

## H. Insulation: NFPA 70, Type THHN/THWN.

## 2.05 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. Connectors for Grounding and Bonding: Comply with Section 26 05 26.
- C. Wiring Connectors for Splices and Taps:
  1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
  2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.
- D. Wiring Connectors for Terminations:
  1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
  2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.

3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
4. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.
5. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
6. Stranded Conductors Size 10 AWG and Smaller: Use crimped terminals for connections to terminal screws.
7. Conductors for Control Circuits: Use crimped terminals for all connections.
- E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.
- F. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.
- G. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
  1. Manufacturers:
    - a. 3M: [www.3m.com/#sle](http://www.3m.com/#sle).
    - b. Ideal Industries, Inc: [www.idealindustries.com/#sle](http://www.idealindustries.com/#sle).
    - c. NSI Industries LLC: [www.nsiindustries.com/#sle](http://www.nsiindustries.com/#sle).
    - d. Or approved equal.
    - e. Substitutions: See Section 01 60 00 - Product Requirements.
- H. Mechanical Connectors: Provide bolted type or set-screw type.
  1. Manufacturers:
    - a. Burndy LLC: [www.burndy.com/#sle](http://www.burndy.com/#sle).
    - b. nVent ILSCO: [www.ilsco.com/#sle](http://www.ilsco.com/#sle).
    - c. Thomas & Betts Corporation: [www.tnb.com/#sle](http://www.tnb.com/#sle).

- d. Or approved equal.
  - e. Substitutions: See Section 01 60 00 - Product Requirements.
- I. Compression Connectors: Provide circumferential type or hex type crimp configuration with prestressed insulation to equal the insulation of wire being installed. .
  - 1. Manufacturers:
    - a. Burndy LLC: [www.burndy.com/#sle](http://www.burndy.com/#sle).
    - b. nVent ILSCO: [www.ilsco.com/#sle](http://www.ilsco.com/#sle).
    - c. Thomas & Betts Corporation: [www.tnb.com/#sle](http://www.tnb.com/#sle).
    - d. Or approved equal.
    - e. Substitutions: See Section 01 60 00 - Product Requirements.
- J. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.
  - 1. Manufacturers:
    - a. Burndy LLC: [www.burndy.com/#sle](http://www.burndy.com/#sle).
    - b. IlSCO: [www.ilsco.com/#sle](http://www.ilsco.com/#sle).
    - c. Thomas & Betts Corporation: [www.tnb.com/#sle](http://www.tnb.com/#sle).
    - d. Or approved equal.
    - e. Substitutions: See Section 01 60 00 - Product Requirements.
- K. Power Conductor Splicers
  - 1. Blackburn.
  - 2. Burndy "Hylug".
  - 3. Ilso.
  - 4. O.Z. Gedney.

## 2.06 ACCESSORIES

A. Electrical Tape:

1. Manufacturers:

- a. 3M: [www.3m.com/#sle](http://www.3m.com/#sle).
- b. Plymouth Rubber Europa: [www.plymouthrubber.com/#sle](http://www.plymouthrubber.com/#sle).
- c. Or approved equal.
- d. Substitutions: See Section 01 60 00 - Product Requirements.

- 2. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.
- 3. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.
- 4. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil; suitable for continuous temperature environment up to 194 degrees F and short-term 266 degrees F overload service.
- 5. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil; suitable for continuous temperature environment up to 176 degrees F.
- 6. Varnished Cambric Electrical Tape: Cotton cambric fabric tape, with or without adhesive, oil-primed and coated with high-grade insulating varnish; minimum thickness of 7 mil; suitable for continuous temperature environment up to 221 degrees F.
- 7. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil.

B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.

1. Manufacturers:

- a. 3M: [www.3m.com/#sle](http://www.3m.com/#sle).
  - b. Burndy LLC: [www.burndy.com/#sle](http://www.burndy.com/#sle).
  - c. Thomas & Betts Corporation: [www.tnb.com/#sle](http://www.tnb.com/#sle).
  - d. Or approved equal.
  - e. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.
- 1. Manufacturers:
    - a. Burndy LLC: [www.burndy.com/#sle](http://www.burndy.com/#sle).
    - b. Ideal Industries, Inc: [www.idealindustries.com/#sle](http://www.idealindustries.com/#sle).
    - c. IlSCO: [www.ilsco.com/#sle](http://www.ilsco.com/#sle).
    - d. Or approved equal.
    - e. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Wire Pulling Lubricant:
- 1. Manufacturers:
    - a. 3M: [www.3m.com/#sle](http://www.3m.com/#sle).
    - b. American Polywater Corporation: [www.polywater.com/#sle](http://www.polywater.com/#sle).
    - c. Ideal Industries, Inc: [www.idealindustries.com/#sle](http://www.idealindustries.com/#sle).
    - d. Or approved equal.
    - e. Substitutions: See Section 01 60 00 - Product Requirements.
  - 2. Listed and labeled as complying with UL 267.
  - 3. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
  - 4. Suitable for use at installation temperature.
- E. Cable Ties: Material and tensile strength rating suitable for application.

1. Manufacturers:
  - a. Burndy LLC: [www.burndy.com/#sle](http://www.burndy.com/#sle).
  - b. Scotchflex.
  - c. Thomas & Betts.
  - d. Or approved equal.
  - e. Substitutions: See Section 01 60 00 - Product Requirements.
- F. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for cables and roofing system to be installed; designed to accommodate existing penetrations where applicable.
  1. Products:
    - a. Menzies Metal Products; Electrical Roof Stack and Cap: [www.menzies-metal.com/#sle](http://www.menzies-metal.com/#sle).
    - b. Menzies Metal Products; Electrical Retro Box: [www.menzies-metal.com/#sle](http://www.menzies-metal.com/#sle).
    - c. Substitutions: See Section 01 60 00 - Product Requirements.
- G. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.
  1. Products:
    - a. HoldRite, a brand of Reliance Worldwide Corporation; HydroFlame Pro Series/HydroFlame Custom Built: [www.holdrite.com/#sle](http://www.holdrite.com/#sle).
    - b. Substitutions: See Section 01 60 00 - Product Requirements.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that interior of building has been protected from weather.
- B. Verify that work likely to damage wire and cable has been completed.

- C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
- D. Verify that raceway installation is complete and supported.
- E. Verify that field measurements are as indicated.
- F. Verify that conditions are satisfactory for installation prior to starting work.

### 3.02 PREPARATION

- A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

### 3.03 INSTALLATION

#### A. Circuiting Requirements:

1. Unless dimensioned, circuit routing indicated is diagrammatic.
2. When circuit destination is indicated without specific routing, determine exact routing required.
3. Arrange circuiting to minimize splices.
4. Include circuit lengths required to install connected devices within 10 ft of location indicated.
5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
6. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
7. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is permitted, under the following conditions:
  - a. Provide no more than six current-carrying conductors in a single raceway. Dedicated neutral conductors are considered current-carrying conductors.
  - b. Increase size of conductors as required to account for ampacity derating.
  - c. Size raceways, boxes, etc. to accommodate conductors.

- d. Record any circuit changes on record drawings.
- 8. Common Neutrals: Sharing of neutral/grounded conductors among branch circuits is not permitted.
- 9. Provide oversized neutral/grounded conductors where indicated and as specified below.
  - a. Provide 200 percent rated neutral for feeders fed from K-rated transformers.
  - b. Provide 200 percent rated neutral for feeders serving panelboards with 200 percent rated neutral bus.
- B. Install products in accordance with manufacturer's instructions.
- C. Perform work in accordance with NECA 1 (general workmanship).
- D. Installation in Raceway:
  - 1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
  - 2. Pull all conductors and cables together into raceway at same time.
  - 3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
  - 4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
- E. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
- F. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
  - 1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.
  - 2. Installation in Vertical Raceways: Provide supports where vertical rise exceeds permissible limits.

- G. Terminate cables using suitable fittings.
- H. Install conductors with a minimum of 12 inches of slack at each outlet.
- I. Where conductors are installed in enclosures for future termination by others, provide a minimum of 5 feet of slack.
- J. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- K. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
- L. 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 contaminants. Do not use wire brush on plated connector surfaces.
  - 5. Connections for Aluminum Conductors: Fill connectors with oxide inhibiting compound where not pre-filled by manufacturer.
  - 6. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
  - 7. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- M. 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.
  - 1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.

- a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
    - b. For taped connections likely to require re-entering, including motor leads, first apply varnished cambric electrical tape, followed by adequate amount of rubber splicing electrical tape, followed by outer covering of vinyl insulating electrical tape.
  2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
    - a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
    - b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.
  3. Wet Locations: Use heat shrink tubing.
- N. Insulate ends of spare conductors using vinyl insulating electrical tape.
- O. 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.
- P. Identify conductors and cables in accordance with Section 26 05 53.
- Q. Color Code Legend: Provide identification label identifying color code for ungrounded conductors at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
- R. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 92 00 Joint Sealants.
- S. 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.
- T. Install wire and cable securely, in a neat and workmanlike manner, as specified in NECA 1.

- U. Route wire and cable as required to meet project conditions.
  - 1. Wire and cable routing indicated is approximate unless dimensioned.
  - 2. Where wire and cable destination is indicated and routing is not shown, determine exact routing and lengths required.
  - 3. Include wire and cable of lengths required to install connected devices within 10 ft of location shown.
- V. Use wiring methods indicated.
- W. Pull all conductors into raceway at same time.
- X. Use suitable wire pulling lubricant for building wire 4 AWG and larger.
- Y. Protect exposed cable from damage.
- Z. 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.
- AA. Use suitable cable fittings and connectors.
- BB. Neatly train and lace wiring inside boxes, equipment, and panelboards.
- CC. Clean conductor surfaces before installing lugs and connectors.
- DD. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
- EE. 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.
- FF. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.
- GG. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

### 3.04 FIELD QUALITY CONTROL

- A. Inspect wire for physical damage and proper connections.

- B. Measure tightness of bolted connections and compare torque measurements with manufacturer's values.
- C. Inspect and test in accordance with NETA ATS, except Section 4.
- D. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.
  - 1. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.
- E. Correct deficiencies and replace damaged or defective conductors and cables.
- F. Perform field inspection
- G. Megger test and record all feeder conductors.
  - 1. Replace conductors failing test.
  - 2. Test replaced conductors in same manner.

END OF SECTION

SECTION 26 05 26  
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Grounding and bonding requirements.
- B. Conductors for grounding and bonding.
- C. Connectors for grounding and bonding.
- D. Ground bars.
- E. Ground enhancement material.
- F. Pre-fabricated signal reference grids.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 00 - Common Work Results for Electrical.
- B. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
  - 1. Includes oxide inhibiting compound.
- C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

- A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System; 2012.
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; 2022.
- D. NETA ATS - Standard for Acceptance Testing Specifications for Electrical Power Equipment And Systems; 2025.

- E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. NFPA 780 - Standard for the Installation of Lightning Protection Systems; 2026.
- G. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

#### 1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Verify exact locations of underground metal water service pipe entrances to building.
  - 2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
  - 3. Notify LP Consulting Engineers, Inc. of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

#### 1.05 SUBMITTALS

- A. See Section 01 33 00 for submittals procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.
- C. Shop Drawings:
  - 1. Indicate proposed arrangement for signal reference grids. Include locations of items to be bonded and methods of connection.
- D. 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.
- E. Field quality control test reports.
- F. Project Record Documents: Record actual locations of grounding electrode system components and connections.

#### 1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.

- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Installer Qualifications for Signal Reference Grids: Company with minimum five years documented experience with high frequency grounding systems.
- E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

### **PART 2 PRODUCTS**

#### 2.01 GROUNDING AND BONDING REQUIREMENTS

- A. Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.
- B. Do not use products for applications other than as permitted by NFPA 70 and product listing.
- C. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
- D. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- E. Grounding System Resistance:
  - 1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by LP Consulting Engineers, Inc.. Precipitation within the previous 48 hours does not constitute normally dry conditions.

2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.
3. Between Grounding Electrode System and Major Electrical Equipment Frames, System Neutral, and Derived Neutral Points: Not greater than 0.5 ohms, when tested using "point-to-point" methods.

F. Grounding Electrode System:

1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
  - a. Provide continuous grounding electrode conductors without splice or joint.
  - b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
2. Metal In-Ground Support Structure:
  - a. Provide connection to metal in-ground support structure that is in direct contact with earth in accordance with NFPA 70.

G. Bonding and Equipment Grounding:

1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.

6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:
  - a. Metal process piping.
8. Provide bonding for interior metal air ducts.
9. Provide bonding for metal building frame.
10. Provide bonding for metal siding not effectively bonded through attachment to metal building frame.

#### H. Communications Systems Grounding and Bonding:

1. Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for any additional buildings or structures in accordance with NFPA 70.
2. Provide bonding jumper in raceway from intersystem bonding termination to each communications room or backboard and provide ground bar for termination.
  - a. Bonding Jumper Size: 6 AWG, unless otherwise indicated or required.
  - b. Raceway Size: 3/4 inch trade size unless otherwise indicated or required.
  - c. Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.
  - d. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.

## 2.02 GROUNDING AND BONDING COMPONENTS

### A. General Requirements:

1. Provide products listed, classified, and labeled as suitable for the purpose intended.
2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 05 26:

1. Use insulated copper conductors unless otherwise indicated.
  - a. Exceptions:
    - 1) Use bare copper conductors where installed underground in direct contact with earth.
    - 2) Use bare copper conductors where directly encased in concrete (not in raceway).
2. Factory Pre-fabricated Bonding Jumpers: Furnished with factory-installed ferrules; size braided cables to provide equivalent gauge of specified conductors.

C. Connectors for Grounding and Bonding:

1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
  - a. Exceptions:
    - 1) Use mechanical connectors for connections to electrodes at ground access wells.
3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.
  - a. Exceptions:
    - 1) Use exothermic welded connections for connections to metal building frame.
4. Manufacturers - Mechanical and Compression Connectors:
  - a. Advanced Lightning Technology (ALT): [www.altfab.com/#sle](http://www.altfab.com/#sle).
  - b. Burndy LLC: [www.burndy.com/#sle](http://www.burndy.com/#sle).

c. Harger Lightning & Grounding: [www.harger.com/#sle](http://www.harger.com/#sle).

d. Thomas & Betts Corporation: [www.tnb.com/#sle](http://www.tnb.com/#sle).

5. Manufacturers - Exothermic Welded Connections:

a. Burndy LLC: [www.burndy.com/#sle](http://www.burndy.com/#sle).

b. nVent ERICO; Cadweld: [www.nvent.com/#sle](http://www.nvent.com/#sle).

c. thermOweld, subsidiary of Continental Industries; division of Burndy LLC;  
\_\_\_\_\_: [www.thermoweld.com/#sle](http://www.thermoweld.com/#sle).

d. Substitutions: See Section 01 60 00 - Product Requirements.

D. Ground Bars:

1. Description: Copper rectangular ground bars with mounting brackets and insulators.

2. Size: As indicated.

3. Holes for Connections: As indicated or as required for connections to be made.

4. Manufacturers:

a. allG Fabrication: [www.allgfab.com/#sle](http://www.allgfab.com/#sle).

b. Harger Lightning & Grounding: [www.harger.com/#sle](http://www.harger.com/#sle).

c. nVent ERICO: [www.nvent.com/#sle](http://www.nvent.com/#sle).

d. thermOweld, subsidiary of Continental Industries; division of Burndy LLC:  
[www.thermoweld.com/#sle](http://www.thermoweld.com/#sle).

e. Substitutions: See Section 01 60 00 - Product Requirements.

E. Ground Enhancement Material:

1. Description: Factory-mixed conductive material designed for permanent and maintenance-free improvement of grounding effectiveness by lowering resistivity.

2. Resistivity: Not more than 20 ohm-cm in final installed form.

3. Manufacturers:

- a. Harger Lightning & Grounding: [www.harger.com/#sle](http://www.harger.com/#sle).
- b. nVent ERICO; GEM: [www.nvent.com/#sle](http://www.nvent.com/#sle).
- c. thermOweld, subsidiary of Continental Industries; division of Burndy LLC;  
\_\_\_\_\_ : [www.thermoweld.com/#sle](http://www.thermoweld.com/#sle).
- d. Substitutions: See Section 01 60 00 - Product Requirements.

F. Oxide Inhibiting Compound: Comply with Section 26 05 19.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that work likely to damage grounding and bonding system components has been completed.
- B. Verify that field measurements are as indicated.
- C. Verify that conditions are satisfactory for installation prior to starting work.

#### **3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70.
  - 1. Outdoor Installations: Unless otherwise indicated, install with top of rod 6 inches below finished grade.
  - 2. Indoor Installations: Unless otherwise indicated, install with 4 inches of top of rod exposed.
- D. Make grounding and bonding connections using specified connectors.
  - 1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.

2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
  3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
  4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
  5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- E. Identify grounding and bonding system components in accordance with Section 26 05 53.

### 3.03 FIELD QUALITY CONTROL

- A. Inspect and test in accordance with NETA ATS except Section 4.
- B. Perform inspections and tests listed in NETA ATS, Section 7.13.
- C. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.
- D. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.
- E. Submit detailed reports indicating inspection and testing results and corrective actions taken.

END OF SECTION



SECTION 26 05 29  
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 00 – Common Work Results for Electrical.
- B. Section 26 05 33.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.
- C. Section 26 05 33.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.
- D. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.
- E. Section 26 51 00 - Interior Lighting: Additional support and attachment requirements for interior luminaires.

1.03 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.
- C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.
- D. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2022.
- E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2024.
- F. MFMA-4 - Metal Framing Standards Publication; 2004.
- G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.

- H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. UL 5B - Strut-Type Channel Raceways and Fittings; Current Edition, Including All Revisions.

#### 1.04 ADMINISTRATIVE REQUIREMENTS

##### A. Coordination:

1. Coordinate sizes and arrangement of supports and bases with actual equipment and components to be installed.
2. Coordinate work to provide additional framing and materials required for installation.
3. Coordinate compatibility of support and attachment components with mounting surfaces at installed locations.
4. Coordinate arrangement of supports with ductwork, piping, equipment and other potential conflicts.
5. Notify LP Consulting Engineers, Inc. of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

#### 1.05 SUBMITTALS

- A. See Section 01 33 00 for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel/strut framing systems, nonpenetrating rooftop supports, and post-installed concrete/masonry anchors.
  1. Fiberglass Channel/Strut Framing Systems: Include requirements for strength derating according to ambient temperature.
- C. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.
- D. Derating Calculations for Fiberglass Channel/Strut Framing Systems: Indicate load ratings adjusted for applicable service conditions.

- E. Evaluation Reports: For products specified as requiring evaluation and recognition by ICC Evaluation Service, LLC (ICC-ES), provide current ICC-ES evaluation reports upon request.
- F. Installer's qualification statement.
- G. 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.

#### 1.06 QUALITY ASSURANCE

- A. Maintain at project site one copy of each referenced document that prescribes execution requirements.
- B. Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

### **PART 2 PRODUCTS**

#### 2.01 SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:
  - 1. Comply with the following. Where requirements differ, comply with most stringent.
    - a. NFPA 70.
    - b. Applicable building code.
    - c. Requirements of authorities having jurisdiction.
  - 2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of electrical work.
  - 3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.

4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported with a minimum safety factor of 25%. Include consideration for vibration, equipment operation, and shock loads where applicable.
5. Do not use products for applications other than as permitted by NFPA 70 and product listing.
6. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
7. Steel Components: Use corrosion-resistant materials suitable for environment where installed.
  - a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
  - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
  - c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
  - d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Components for Vibration Isolation and/or Seismic Controls: See Section 26 05 48.
- C. Conduit and Cable Supports: Straps and clamps suitable for conduit or cable to be supported.
  1. Manufacturers:
    - a. ABB: [www.electrification.us.abb.com/#sle](http://www.electrification.us.abb.com/#sle).
    - b. Eaton Corporation: [www.eaton.com/#sle](http://www.eaton.com/#sle).
    - c. Emerson Electric Co; O-Z/Gedney: [www.emerson.com/#sle](http://www.emerson.com/#sle).
    - d. HoldRite, a brand of Reliance Worldwide Corporation: [www.holdrite.com/#sle](http://www.holdrite.com/#sle).
    - e. Substitutions: See Section 01 60 00 - Product Requirements.
  2. Conduit Straps: One-hole or two-hole type; steel or malleable iron.

3. Conduit Clamps: Bolted type unless otherwise indicated.
- D. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.
- E. Metal Channel/Strut Framing Systems:
  1. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
  2. Comply with MFMA-4.
  3. Channel/Strut Used as Raceway, Where Indicated: Listed and labeled as complying with UL 5B.
  4. Channel Material:
    - a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
    - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
  5. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch.
  6. Minimum Channel Dimensions: 1-5/8 inch width by 1-5/8 inch height.
- F. Fiberglass Channel/Strut Framing Systems:
  1. Description: Factory-fabricated, continuous-slot, fiberglass channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
  2. Channel Material: Use polyester resin or vinyl ester resin.
  3. Minimum Channel Dimensions: 1-5/8 inch wide by 1 inch high.
  4. Flammability: Fire retardant with NFPA 101, Class A flame spread index, maximum of 25, when tested in accordance with ASTM E84; self extinguishing in accordance with ASTM D635.
- G. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.
  1. Minimum Size, Unless Otherwise Indicated or Required:
    - a. Equipment Supports: 1/2-inch diameter.

- b. Single Conduit up to 1-inch (27 mm) Trade Size: 1/4-inch diameter.
- c. Single Conduit Larger than 1-inch (27 mm) Trade Size: 3/8-inch diameter.
- d. Trapeze Support for Multiple Conduits: 3/8-inch diameter.
- e. Outlet Boxes: 1/4-inch diameter.
- f. Luminaires: 1/4-inch diameter.

H. Nonpenetrating Rooftop Supports for Low-Slope Roofs:

- 1. Description: Steel pedestals with thermoplastic or rubber bases that rest on top of roofing membrane, not requiring attachment to roof structure and not penetrating roofing assembly, with support fixtures as specified.
- 2. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
- 3. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.
- 4. Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.

I. Anchors and Fasteners:

- 1. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.
- 2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
- 3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
- 4. Hollow Masonry: Use toggle bolts.
- 5. Hollow Stud Walls: Use toggle bolts.
- 6. Steel: Use beam clamps, machine bolts, or welded threaded studs.
- 7. Sheet Metal: Use sheet metal screws.
- 8. Wood: Use wood screws.
- 9. Hammer-driven anchors and fasteners are not permitted.

- a. Nails are permitted for attachment of nonmetallic boxes to wood frame construction.
  - b. Staples are permitted for attachment of nonmetallic-sheathed cable to wood frame construction.
10. Preset Concrete Inserts: Continuous metal channel/strut and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
- a. Manufacturer: Same as manufacturer of metal channel/strut framing system.
  - b. Comply with MFMA-4.
  - c. Channel Material: Use galvanized steel.
  - d. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch minimum base metal thickness.
11. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.

## 2.02 SUPPORTS

- A. Pipe hangers for individual conduits shall be factory made, consisting of a pipe ring and threaded suspension rod. The pipe ring shall be malleable iron, split and hinged, or shall be springable wrought steel. Rings shall be bolted to or interlocked with the suspension rod socket.
- B. Pipe racks for groups of parallel conduits shall be constructed of galvanized structural steel preformed channels of length as required, suspended on threaded rods and secured thereto with nuts above and below the cross bar.
- C. Factory made pipe straps shall be one hole malleable iron or two hole galvanized clamps.
- D. Supporting rods shall be at least 3/8" diameter and channel shall be at least 3/4" deep. Supporting hardware shall be galvanized steel.

## 2.03 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. Sheet Metal Screws: Steel
  - 2. Machine Screws Bolts, Nuts and Washers: Steel
  - 3. Precast Inserts: Suitable for the purpose.
  - 4. Anchor Bolts, expansion type (stainless steel).
    - a. Phillips Red-Head
    - b. Hilti Kwik-Bolt.
    - c. WEJ-IT.
  - 5. Cast-in-Place Anchors: Suitable for the purpose (hot-dip galvanized except cadmium plated in dry locations)
  - 6. Beam Clamps: Steel.
- D. Concrete Structural Elements: Use precast inserts, expansion anchors, or preset inserts.
- E. Steel Structural Elements: Use beam clamps or welded fasteners.
- F. Concrete Surfaces: Use self-drilling anchors or expansion anchors.
- G. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts or hollow wall fasteners.
- H. Solid Masonry Walls: Use expansion anchors or preset inserts.
- I. Sheet Metal: Use sheet metal screws.
- J. Wood Elements: Use wood screws.
- K. Fastener Types:
  - 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. Other Types: As required.
6. Manufacturers:
  - a. Powers Fasteners, Inc: [www.powers.com](http://www.powers.com).
  - b. Or approved equal.
- L. Formed Steel Channel as indicated on drawings.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive support and attachment components.
- C. Verify that conditions are satisfactory for installation prior to starting work.

#### **3.02 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install hangers and supports in accordance with NECA 1.
- C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- D. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- E. Unless specifically indicated or approved by LP Consulting Engineers, Inc., do not provide support from suspended ceiling support system or ceiling grid.
- F. Unless specifically indicated or approved by LP Consulting Engineers, Inc., do not provide support from roof deck.
- G. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- H. Provide required vibration isolation and/or seismic controls; see Section 26 05 48.

- I. Equipment Support and Attachment:
  - 1. Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.
  - 2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
  - 3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
  - 4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- J. Conduit Support and Attachment: See Section 26 05 33.13 for additional requirements.
- K. Box Support and Attachment: See Section 26 05 33.16 for additional requirements.
- L. Interior Luminaire Support and Attachment: See Section 26 51 00 for additional requirements.
- M. Secure fasteners in accordance with manufacturer's recommended torque settings.
- N. Remove temporary supports.
- O. Identify independent electrical component support wires above accessible ceilings, where permitted, with color distinguishable from ceiling support wires in accordance with NFPA 70.

### 3.03 FIELD QUALITY CONTROL

- A. Inspect support and attachment components for damage and defects.
- B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- C. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

SECTION 26 05 33.13  
CONDUIT FOR ELECTRICAL SYSTEMS

**PART 1 GENERAL**

1.01 SUMMARY

- A. Scope: Provide rigid metallic conduit, rigid non-metallic conduit, intermediate metal conduit, flexible metal conduit, electrical metallic tubing, surface metal and/or non-metallic raceways, cable tray and wireways as shown on the drawings and as described in the specifications.

1.02 SECTION INCLUDES

- A. Galvanized steel rigid metal conduit (RMC).
- B. Galvanized steel intermediate metal conduit (IMC).
- C. Flexible metal conduit (FMC).
- D. Liquidtight flexible metal conduit (LFMC).
- E. Galvanized steel electrical metallic tubing (EMT).

1.03 RELATED REQUIREMENTS

- A. Section 07 92 00 Joint Sealants.
- B. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Cable assemblies consisting of conductors protected by integral metal armor.
- C. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
  - 1. Includes additional requirements for fittings for grounding and bonding.
- D. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- E. Section 26 05 33.16 - Boxes for Electrical Systems.
- F. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.
- G. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.04 REFERENCE STANDARDS

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2020.
- B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2020.
- C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit; 2018.
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2020.
- F. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2025.
- G. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- H. NEMA TC 14 (SERIES) - Reinforced Thermosetting Resin Conduit and Fittings Series; 2015.
- I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.
- K. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.
- L. UL 360 - Liquid-Tight Flexible Metal Conduit; Current Edition, Including All Revisions.
- M. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.
- N. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.
- O. UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.
- P. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.
- Q. UL 1660 - Liquid-Tight Flexible Nonmetallic Conduit; Current Edition, Including All Revisions.
- R. UL 2419 - Outline of Investigation for Electrically Conductive Corrosion Resistant Compounds; Current Edition, Including All Revisions.

#### 1.05 ADMINISTRATIVE REQUIREMENTS

##### A. Coordination:

1. Coordinate minimum sizes of conduits with actual type and quantity of conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
2. Coordinate arrangement of conduits with structural members, ductwork, piping, equipment, and other potential conflicts.
3. Verify exact conduit termination locations required for boxes, enclosures, and equipment.
4. Coordinate work to provide roof penetrations that preserve integrity of roofing system and do not void roof warranty.
5. Notify Electrical Engineer of Record of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

##### B. Sequencing:

1. Do not begin installation of conductors and cables until installation of conduit between termination points is complete.

#### 1.06 SUBMITTALS

##### A. See Section 01 33 00 for submittals procedures.

##### B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

##### C. Shop Drawings:

1. Indicate proposed arrangement for conduits to be installed within structural concrete slabs, where permitted.
2. Include proposed locations of roof penetrations and proposed methods for sealing.

##### D. Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs, and conduits 2-inch (53 mm) trade size and larger.

#### 1.07 QUALITY ASSURANCE

- A. Documents at Project Site: Maintain at project site one copy of manufacturer's instructions and shop drawings.
- B. Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

**PART 2 PRODUCTS**

2.01 CONDUIT APPLICATIONS

- A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, manufacturer's instructions, and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.
- C. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT).
- D. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT).
- E. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT).
- F. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT).
- G. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT).
  - 1. Locations subject to physical damage include, but are not limited to:

- a. Where exposed below 8 feet, except within electrical and communication rooms or closets.
  - b. Where exposed below 20 feet in warehouse areas.
  - c. In Correctional Facilities, Galvanized rigid steel only for inmate accessible areas. Locations shall be verified with the architect.
- H. Exposed, Interior, Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC) or galvanized steel intermediate metal conduit (IMC).
  - 1. Locations subject to severe physical damage include, but are not limited to:
    - a. High traffic industrial and warehouse areas where exposed below 8 feet, except within electrical and communication rooms or closets.
    - b. Where exposed below 20 feet in industrial manufacturing areas.
- I. Exposed, Exterior, Not Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT).
- J. Exposed, Exterior, Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC) or galvanized steel intermediate metal conduit (IMC).
  - 1. Exterior locations subject to severe physical damage include, but are not limited to:
    - a. Where exposed to vehicular traffic below 20 feet.
- K. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), or galvanized steel electrical metallic tubing (EMT).
- L. Flexible Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit (FMC).
  - 1. Maximum Length: 6 feet.
- M. Flexible Connections to Vibrating Equipment:
  - 1. Dry Locations: Use flexible metal conduit (FMC).
  - 2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit (LFMC).

3. Maximum Length: 6 feet unless otherwise indicated.
4. Vibrating equipment includes, but is not limited to:
  - a. Transformers.
  - b. Motors.
  - c. Engine generators.

N. Fished in Existing Walls, Where Necessary: Use flexible metal conduit.

## 2.02 CONDUIT - GENERAL REQUIREMENTS

- A. Comply with NFPA 70.
- B. Existing Work: Where existing conduits are indicated to be reused, they may be reused only where they comply with specified requirements, are free from corrosion, and integrity is verified by pulling mandrel through them.
- C. Fittings for Grounding and Bonding: See Section 26 05 26 for additional requirements.
- D. Provide conduit, fittings, supports, and accessories required for complete raceway system.
- E. Provide products listed, classified, and labeled as suitable for purpose intended.
- F. Minimum Conduit Size, Unless Otherwise Indicated:
  1. Branch Circuits: 1/2-inch trade size.
  2. Branch Circuit Homeruns: 3/4-inch trade size.
  3. Control Circuits: 1/2-inch trade size.
  4. Flexible Connections to Luminaires: 1/2 inch (16 mm) trade size.
  5. Underground, Interior: 1 inch (27 mm) trade size.
  6. Underground, Exterior: 1-inch trade size.
- G. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

## 2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Manufacturers:

1. Allied Tube & Conduit, a division of Atkore International  
: [www.alliedeg.com/#sle](http://www.alliedeg.com/#sle).
  2. Nucor Tubular Products: [www.nucortubular.com/#sle](http://www.nucortubular.com/#sle).
  3. Rymco USA: [www.rymcousa.com/#sle](http://www.rymcousa.com/#sle).
  4. Western Tube, a division of Zekelman Industries: [www.westerntube.com/#sle](http://www.westerntube.com/#sle).
  5. Wheatland Tube, a division of Zekelman Industries: [www.wheatland.com/#sle](http://www.wheatland.com/#sle).
  6. Or approved equal.
  7. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- C. Fittings:
1. Manufacturers:
    - a. ABB; T&B: [www.electrification.us.abb.com/#sle](http://www.electrification.us.abb.com/#sle).
    - b. Allied Tube & Conduit, a division of Atkore International: [www.alliedeg.us/#sle](http://www.alliedeg.us/#sle).
    - c. Bridgeport Fittings Inc: [www.bptfittings.com/#sle](http://www.bptfittings.com/#sle).
    - d. Appleton.
    - e. Crouse-Hinds.
    - f. Emerson Electric Co; O-Z/Gedney: [www.emerson.com/#sle](http://www.emerson.com/#sle).
    - g. \_\_\_\_\_.
    - h. Substitutions: See Section 01 60 00 - Product Requirements.
  2. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.
  3. Hazardous/Classified Locations: Use fittings listed and labeled as complying with UL 1203 for classification of installed location.
  4. Material: Use steel or malleable iron.
    - a. Do not use die cast zinc fittings.

5. Connectors and Couplings: Where an expansion type fitting is not required, use a coupling or "Erickson" type coupling as appropriate. Threadless set screw and compression (gland) type fittings are not permitted.
6. At building expansion joints, use expansion type fittings.
7. Make connections to NEMA 12 boxes with a threaded hub.

D. Locknuts

1. Hardened Steel or malleable iron construction, electro zinc plated, capable of insuring positive bond to enclosure.
  - a. Non-bonding: T & B Series 142 or approved equal.
  - b. Bonding: T & B Series 107 or approved equal.

E. Bushings

1. Insulated: T & B Series 223 or approved equal.
2. Insulated Metallic Bushing: T & B Series 1223 or approved equal.
3. Insulated Grounding and Bonding Bushing: T & B Series 3871 or approved equal.

F. Couplings

1. Non-metallic Conduit Coupling: By non-metallic conduit manufacturer for the application.
2. Threaded Rigid Metal Conduit Couplings: By conduit manufacturer for the application.
3. Threadless Coupling: "Erickson" Type Y & B Series 676 or approved equal.
4. Expansion Type: Permit  $\frac{3}{4}$  inch movement any direction.
  - a. Exposed: Weatherproof with external bonding jumper.
  - b. Embedded: Watertight with internal bonding jumper.

G. Connectors

1. Non-Metallic Conduit Connector: By conduit manufacturer for the application.

2. Threaded Hubs: Electro zinc coated with nylon insulated throat and oil/moisture resistant recessed sealing ring, raintight.
  - a. Non-bonding: T & B Series 371 or approved equal.
  - b. Bonding: T & B Series 371 with 107 series bonding locknut or approved equals.
- H. Nipple: "Chase" Type, insulated: T & B Series 5263 or approved equal.
- I. Sealing Gaskets: Oil and moisture resistant rubber bonded to metallic retainer.
  1. With rigid conduit – T & B Series 5303 or approved equal.
  2. Fittings not specifically listed but required shall be of similar style and quality.

#### 2.04 GALVANIZED STEEL INTERMEDIATE METAL CONDUIT (IMC)

##### A. Manufacturers:

1. Allied Tube & Conduit, a division of Atkore International: [www.alliedeg.com/#sle](http://www.alliedeg.com/#sle).
2. Nucor Tubular Products: [www.nucortubular.com/#sle](http://www.nucortubular.com/#sle).
3. Rymco USA: [www.rymcousa.com/#sle](http://www.rymcousa.com/#sle).
4. Western Tube, a division of Zekelman Industries: [www.westerntube.com/#sle](http://www.westerntube.com/#sle).
5. Wheatland Tube, a division of Zekelman Industries: [www.wheatland.com/#sle](http://www.wheatland.com/#sle).
6. \_\_\_\_\_.
7. Substitutions: See Section 01 60 00 - Product Requirements.

##### B. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.

##### C. Fittings:

1. Manufacturers:
  - a. Bridgeport Fittings, LLC: [www.bptfittings.com/#sle](http://www.bptfittings.com/#sle).
  - b. Emerson Electric Co; O-Z/Gedney: [www.emerson.com/#sle](http://www.emerson.com/#sle).
  - c. Or approved equal.

- d. Substitutions: See Section 01 60 00 - Product Requirements.
  - 2. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 1242.
  - 3. Hazardous/Classified Locations: Use fittings listed and labeled as complying with UL 1203 for classification of installed location.
  - 4. Material: Use steel or malleable iron.
    - a. Do not use die cast zinc fittings.
  - 5. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.
- D. Conduit Size: Comply with NFPA 70.
- 1. Exposed: Use rigid steel conduit or intermediate metal conduit for installation up to 8 feet.

## 2.05 FLEXIBLE METAL CONDUIT (FMC)

### A. Manufacturers:

- 1. AFC Cable Systems, a division of Atkore International: [www.afcweb.com/#sle](http://www.afcweb.com/#sle).
- 2. Electri-Flex Company: [www.electriflex.com/#sle](http://www.electriflex.com/#sle).
- 3. International Metal Hose: [www.metalhose.com/#sle](http://www.metalhose.com/#sle).
- 4. \_\_\_\_\_.
- 5. Substitutions: See Section 01 60 00 - Product Requirements.

### B. 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.

### C. Fittings:

- 1. Manufacturers:
  - a. ABB; T&B: [www.electrification.us.abb.com/#sle](http://www.electrification.us.abb.com/#sle).
  - b. Bridgeport Fittings, LLC: [www.bptfittings.com/#sle](http://www.bptfittings.com/#sle).
  - c. Emerson Electric Co; O-Z/Gedney: [www.emerson.com/#sle](http://www.emerson.com/#sle).
  - d. \_\_\_\_\_.

e. Substitutions: See Section 01 60 00 - Product Requirements.

2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

3. Material: Use steel or malleable iron.

a. Do not use die cast zinc fittings.

D. Description: Interlocked steel construction.

E. Connectors and Fittings: NEMA FB 1.

1. Flexible metal conduit connector – Insulated throat, suitable as grounding means: T & B Series 3115.

## 2.06 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Manufacturers:

1. AFC Cable Systems, a division of Atkore International: [www.afcweb.com/#sle](http://www.afcweb.com/#sle).

2. Electri-Flex Company: [www.electriflex.com/#sle](http://www.electriflex.com/#sle).

3. International Metal Hose: [www.metalhose.com/#sle](http://www.metalhose.com/#sle).

4. \_\_\_\_\_.

5. Substitutions: See Section 01 60 00 - Product Requirements.

B. Fittings:

1. Manufacturers:

a. ABB; T&B: [www.electrification.us.abb.com/#sle](http://www.electrification.us.abb.com/#sle).

b. Bridgeport Fittings, LLC: [www.bptfittings.com/#sle](http://www.bptfittings.com/#sle).

c. Emerson Electric Co; O-Z/Gedney: [www.emerson.com/#sle](http://www.emerson.com/#sle).

d. \_\_\_\_\_.

e. Substitutions: See Section 01 60 00 - Product Requirements.

2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

3. Material: Use steel or malleable iron.

- a. Do not use die cast zinc fittings.

- C. Fittings: NEMA FB 1.

## 2.07 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)

- A. Manufacturers:

1. Allied Tube & Conduit, a division of Atkore International: [www.alliedeg.com/#sle](http://www.alliedeg.com/#sle).
2. Nucor Tubular Products: [www.nucortubular/#sle](http://www.nucortubular/#sle).
3. Rymco USA: [www.rymcousa.com/#sle](http://www.rymcousa.com/#sle).
4. Western Tube, a division of Zekelman Industries: [www.westerntube.com/#sle](http://www.westerntube.com/#sle).
5. Beck Manufacturing, Inc: [www.beckmfg.com](http://www.beckmfg.com).
6. Wheatland Tube, a division of Zekelman Industries: [www.wheatland.com/#sle](http://www.wheatland.com/#sle).
7. \_\_\_\_\_.
8. Substitutions: See Section 01 60 00 - Product Requirements.

- B. Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

- C. Fittings:

1. Manufacturers:
  - a. Bridgeport Fittings, LLC: [www.bptfittings.com/#sle](http://www.bptfittings.com/#sle).
  - b. Emerson Electric Co; O-Z/Gedney: [www.emerson.com/#sle](http://www.emerson.com/#sle).
  - c. Or approved equal.
  - d. Substitutions: See Section 01 60 00 - Product Requirements.
2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Material: Use steel or malleable iron.
  - a. Do not use die cast zinc fittings.
4. Connectors and Couplings: Use compression/gland type.

- a. Do not use indenter type connectors and couplings.
- b. Do not use set-screw type connectors and couplings.
- c. EMT Coupling: Raintight T & B Series 5220 or approved equal.
- d. EMT to Rigid Metal Conduit Connector, Raintight: T & B Series 531 or approved equal.
- 5. Damp or Wet Locations, Where Permitted: Use fittings listed for use in wet locations.
- 6. Embedded Within Concrete, Where Permitted: Use fittings listed as concrete-tight. Fittings that require taping to be concrete-tight are acceptable.
- D. Description: ANSI C80.3; galvanized tubing.
- E. Fittings and Conduit Bodies: NEMA FB 1; steel or malleable iron compression type.

## 2.08 ACCESSORIES

- A. Conduit Joint Compound: Corrosion-resistant, electrically conductive compound listed as complying with UL 2419; suitable for use with conduit to be installed.
- B. Pull Strings: Use nylon or polyester tape with average breaking strength of not less than 1,250 lbf.
- C. Sealing Compound for Hazardous/Classified Location Sealing Fittings: Listed for use with particular fittings to be installed.
  - 1. Internal to fittings
    - a. Approved by manufacturer for application.
  - 2. Manufacturer
    - a. Crouse-Hinds Chico A-P and Chico X fiber.
    - b. O.Z. Gedney.
    - c. Or approved equal.
- D. Sealing Systems for Concrete Penetrations:
  - 1. Sleeves: Provide water stop ring or cement coating that bonds to concrete to prevent water infiltration.

2. Rate for minimum of 40 psig; suitable for sealing around conduits to be installed.
- E. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for conduits and roofing system to be installed; designed to accommodate existing penetrations where applicable.
1. Products:
    - a. Menzies Metal Products; Electrical Roof Stack and Cap: [www.menzies-metal.com/#sle](http://www.menzies-metal.com/#sle).
    - b. Menzies Metal Products; Electrical Retro Box: [www.menzies-metal.com/#sle](http://www.menzies-metal.com/#sle).
    - c. Or approved equal.
    - d. Substitutions: See Section 01 60 00 - Product Requirements.
- F. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.
1. Products:
    - a. Quickflash Weatherproofing Products, Inc: [www.quickflashproducts.com/#sle](http://www.quickflashproducts.com/#sle).
    - b. Or approved equal.
    - c. Substitutions: See Section 01 60 00 - Product Requirements.
- G. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.
1. Products:
    - a. HoldRite, a brand of Reliance Worldwide Corporation; HydroFlame Pro Series/HydroFlame Custom Built: [www.holdrite.com/#sle](http://www.holdrite.com/#sle).
    - b. Or approved equal.
    - c. Substitutions: See Section 01 60 00 - Product Requirements.

### **PART 3 EXECUTION**

### 3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive conduits.
- C. Verify that conditions are satisfactory for installation prior to starting work.

### 3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install conduit in accordance with NECA 1.
- C. Galvanized Steel Rigid Metal Conduit (RMC): Install in accordance with NECA 101.
- D. Intermediate Metal Conduit (IMC): Install in accordance with NECA 101.
- E. Liquidtight Flexible Nonmetallic Conduit (LFNC): Install in accordance with NECA 111.
- F. Conduit Routing:
  - 1. Unless dimensioned, conduit routing indicated is diagrammatic.
  - 2. When conduit destination is indicated without specific routing, determine exact routing required.
  - 3. Conceal conduits unless specifically indicated to be exposed.
  - 4. Conduits in the following areas may be exposed, unless otherwise indicated:
    - a. Electrical rooms.
    - b. Mechanical equipment rooms.
    - c. Within joists in areas with no ceiling.
  - 5. Unless otherwise approved, do not route exposed conduits:
    - a. Across floors.
    - b. Across building exterior surfaces.
  - 6. Conduits installed underground or embedded in concrete may be routed in shortest possible manner unless otherwise indicated. Route other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.

7. Arrange conduit to maintain adequate headroom, clearances, and access.
8. Arrange conduit to provide no more than equivalent of four 90-degree bends between pull points.
9. Arrange conduit to provide no more than 150 feet between pull points.
10. Route conduits above water and drain piping where possible.
11. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
12. Maintain minimum clearance of 6 inches between conduits and piping for other systems.
13. Maintain minimum clearance of 12 inches between conduits and hot surfaces. This includes, but is not limited to:
  - a. Heaters.
  - b. Hot water piping.
  - c. Flues.
14. Group parallel conduits in same area on common rack.

G. Conduit Support:

1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction; see Section 26 05 29.
2. Provide required vibration isolation and/or seismic controls; see Section 26 05 48.
3. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
4. 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.
5. Use conduit strap to support single surface-mounted conduit.
  - a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.

6. Use metal channel/strut with accessory conduit clamps to support multiple parallel surface-mounted conduits.
7. Use conduit clamp to support single conduit from beam clamp or threaded rod.
8. Use trapeze hangers assembled from threaded rods and metal channel/strut with accessory conduit clamps to support multiple parallel suspended conduits.
9. Use nonpenetrating rooftop supports to support conduits routed across rooftops, where approved.
10. Use of spring steel conduit clips for support of conduits is not permitted.
11. Use of wire for support of conduits is not permitted.
12. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with most stringent requirements.

H. Connections and Terminations:

1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
3. Use suitable adapters where required to transition from one type of conduit to another.
4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
6. Where spare conduits stub up through concrete floors and are not terminated in box or enclosure, provide threaded couplings equipped with threaded plugs set flush with finished floor.
7. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect conductors.
8. Secure joints and connections to provide mechanical strength and electrical continuity.

I. 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. Provide suitable sealing system where conduits penetrate exterior wall below grade.
  6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
  7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty.
  8. Provide metal escutcheon plates for conduit penetrations exposed to public view.
  9. Install firestopping to preserve fire resistance rating of partitions and other elements; see Section 07 92 00.
- J. 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 calculated in accordance with NFPA 70 for reinforced thermosetting resin conduit (RTRC) conduit installed above ground to compensate for thermal expansion and contraction.
  3. Where conduits are subject to earth movement by settlement or frost.
- K. Conduit Sealing:
1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:

- a. Where conduits enter building from outside.
  - b. Where service conduits enter building from underground distribution system.
  - c. Where conduits enter building from underground.
  - d. Where conduits may transport moisture to contact live parts.
2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:
- a. Where conduits pass from outdoors into conditioned interior spaces.
  - b. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
- L. Provide pull string in each empty conduit and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.
- M. Provide grounding and bonding; see Section 26 05 26.
- N. Identify conduits; see Section 26 05 53.

### 3.03 FIELD QUALITY CONTROL

- A. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- B. Correct deficiencies and replace damaged or defective conduits.

### 3.04 CLEANING

- A. Clean interior of conduits to remove moisture and foreign matter.

### 3.05 PROTECTION

- A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION



SECTION 26 05 33.16  
BOXES FOR ELECTRICAL SYSTEMS

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.
- B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.
  - 1. Boxes and enclosures for integrated power, data, and audio/video.
  - 2. Floor boxes.
  - 3. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 07 92 00 Joint Sealants.
- B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- C. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- D. Section 26 05 33.13 - Conduit for Electrical Systems:
  - 1. Conduit bodies and other fittings.
  - 2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.
- E. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.
- F. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- G. Section 26 27 26 - Wiring Devices:
  - 1. Wall plates.
  - 2. Floor box service fittings.
  - 3. Access floor boxes.
  - 4. Additional requirements for locating boxes for wiring devices.

### 1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.
- C. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.
- D. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- E. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013 (Reaffirmed 2020).
- F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. SCTE 77 - Specifications for Underground Enclosure Integrity; 2023.
- H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- J. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.
- K. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.
- L. UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.

### 1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
  - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  - 3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.

4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
6. Coordinate the work with other trades to preserve insulation integrity.
7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
8. Notify LP Consulting Engineers, Inc. of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

#### 1.05 SUBMITTALS

- A. See Section 01 33 00 for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures, boxes for hazardous (classified) locations, floor boxes, and underground boxes/enclosures.
  1. Underground Boxes/Enclosures: Include reports for load testing in accordance with SCTE 77 certified by a professional engineer or an independent testing agency upon request.
- C. Samples:
  1. Floor Boxes: Provide one sample(s) of each floor box proposed for substitution upon request.
- D. 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.
- E. Project Record Documents: Record actual locations for outlet and device boxes, pull boxes, cabinets and enclosures, floor boxes, and underground boxes/enclosures.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  1. See Section 01 60 00 - Product Requirements, for additional provisions.
  2. Keys for Lockable Enclosures: Two of each different key.

#### 1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

**1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

**PART 2 PRODUCTS**

**2.01 BOXES**

- A. General Requirements:
  - 1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
  - 2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
  - 3. Provide products listed, classified, and labeled as suitable for the purpose intended.
  - 4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
  - 5. Provide grounding terminals within boxes where equipment grounding conductors terminate.
- B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:
  - 1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
  - 2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
  - 3. Use cast iron boxes or cast aluminum boxes where exposed galvanized steel rigid metal conduit or exposed intermediate metal conduit (IMC) is used.

4. Use cast aluminum boxes where aluminum rigid metal conduit is used.
5. Use suitable concrete type boxes where flush-mounted in concrete.
6. Use suitable masonry type boxes where flush-mounted in masonry walls.
7. Use raised covers suitable for the type of wall construction and device configuration where required.
8. Use shallow boxes where required by the type of wall construction.
9. Do not use "through-wall" boxes designed for access from both sides of wall.
10. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
11. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
12. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
13. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
14. Minimum Box Size, Unless Otherwise Indicated:
  - a. Wiring Devices (Other Than Communications Systems Outlets): 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size.
  - b. Ceiling Outlets: 4 inch octagonal or square by 1-1/2 inch deep (100 by 38 mm) trade size.
15. Wall Plates: Comply with Section 26 27 26.
16. Manufacturers:
  - a. Cooper Crouse-Hinds, a division of Eaton Corporation: [www.cooperindustries.com/#sle](http://www.cooperindustries.com/#sle).
  - b. Hubbell Incorporated; Bell Products; \_\_\_\_\_: [www.hubbell-rtb.com/#sle](http://www.hubbell-rtb.com/#sle).
  - c. Hubbell Incorporated; RACO Products; \_\_\_\_\_: [www.hubbell-rtb.com/#sle](http://www.hubbell-rtb.com/#sle).

- d. O-Z/Gedney, a brand of Emerson Electric Co;  
\_\_\_\_\_ : [www.emerson.com/#sle](http://www.emerson.com/#sle).
  - e. Thomas & Betts Corporation: [www.tnb.com/#sle](http://www.tnb.com/#sle).
  - f. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:
- 1. Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
  - 2. NEMA EN 10250 Environment Type, Unless Otherwise Indicated:
    - a. Indoor Clean, Dry Locations: Type 1, painted steel.
    - b. Outdoor Locations: Type 3R, painted steel.
  - 3. Junction and Pull Boxes Larger Than 100 cubic inches:
    - a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
    - b. Boxes 6 square feet and Larger: Provide sectionalized screw-cover or hinged-cover enclosures.
  - 4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
    - a. Provide lockable hinged covers, all locks keyed alike unless otherwise indicated.
    - b. Back Panels: Painted steel, removable.
    - c. Terminal Blocks: Provide voltage/current ratings and terminal quantity suitable for purpose indicated, with 25 percent spare terminal capacity.
  - 5. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.
  - 6. Manufacturers:
    - a. Cooper B-Line, a division of Eaton Corporation: [www.cooperindustries.com/#sle](http://www.cooperindustries.com/#sle).
    - b. Hoffman, a brand of Pentair Technical Products: [www.hoffmanonline.com/#sle](http://www.hoffmanonline.com/#sle).

- c. Hubbell Incorporated; Wiegmann Products: [www.hubbell-wiegmann.com/#sle](http://www.hubbell-wiegmann.com/#sle).
  - d. Substitutions: See Section 01 60 00 - Product Requirements.
- D. Boxes and Enclosures for Integrated Power, Data, and Audio/Video: Size and configuration as indicated or as required with partitions to separate services; field-connected gangable boxes may be used.
  - 1. Manufacturers:
    - a. Hubbell Incorporated: [www.hubbell.com/#sle](http://www.hubbell.com/#sle).
    - b. Substitutions: See Section 01 60 00 - Product Requirements.
- E. Floor Boxes:
  - 1. Description: Floor boxes compatible with floor box service fittings provided in accordance with Section 26 27 26; with partitions to separate multiple services; furnished with all components, adapters, and trims required for complete installation.
  - 2. Use cast iron floor boxes within slab on grade.
  - 3. Use sheet-steel or cast iron floor boxes within slab above grade.
  - 4. Metallic Floor Boxes: Fully adjustable (with integral means for leveling adjustment prior to and after concrete pour).
  - 5. Manufacturer: Same as manufacturer of floor box service fittings.

## 2.02 ACCESSORIES

- A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for boxes and facade materials to be installed.
  - 1. Manufacturers:
    - a. Quickflash Weatherproofing Products, Inc: [www.quickflashproducts.com/#sle](http://www.quickflashproducts.com/#sle).
    - b. Substitutions: See Section 01 60 00 - Product Requirements.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Boxes are indicated in approximate locations only on the drawings unless specifically dimensioned. Verify all box locations prior to rough-in.
- C. Verify that mounting surfaces are ready to receive boxes.
- D. Verify that conditions are satisfactory for installation prior to starting work.
- E. Verify locations of floor boxes and outlets prior to rough-in.
- F. Verify locations of all boxes required for kitchen equipment with kitchen consultant plans and specifications.

### 3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide separate boxes for emergency power and normal power systems.
- E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.
- F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.
- G. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.
- H. Box Locations:
  - 1. Unless dimensioned, box locations indicated are approximate.
  - 2. Locate boxes as required for devices installed under other sections or by others.
    - a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 26 27 26.
  - 3. Locate boxes so that wall plates do not span different building finishes.

4. Locate boxes so that wall plates do not cross masonry joints.
  5. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
  6. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches horizontal separation unless otherwise indicated.
  7. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches horizontal separation.
  8. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
    - a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.
    - b. Do not install flush-mounted boxes with area larger than 16 square inches or such that the total aggregate area of openings exceeds 100 square inches for any 100 square feet of wall area.
  9. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 26 05 33.13.
  10. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:
    - a. Concealed above accessible suspended ceilings.
    - b. Within joists in areas with no ceiling.
    - c. Electrical rooms.
    - d. Mechanical equipment rooms.
- I. Box Supports:
1. Secure and support boxes in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.

2. Provide required seismic controls in accordance with Section 26 05 48.
  3. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
  4. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
  5. Use far-side support to secure flush-mounted boxes supported from single stud in hollow stud walls. Repair or replace supports for boxes that permit excessive movement.
- J. Install boxes plumb and level.
- K. Flush-Mounted Boxes:
1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.
  2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
  3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.
- L. Install boxes as required to preserve insulation integrity.
- M. Metallic Floor Boxes: Install box level at the proper elevation to be flush with finished floor.
- N. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- O. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 92 00.
- P. Close unused box openings.
- Q. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

- R. Provide grounding and bonding in accordance with Section 26 05 26.
- S. Identify boxes in accordance with Section 26 05 53.
- T. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and as required by NFPA 72.
- U. Set wall mounted boxes at elevations to accommodate mounting heights indicated.
- V. Electrical boxes are shown on Drawings in approximate locations unless dimensioned.
  - 1. Adjust box locations up to 10 feet if required to accommodate intended purpose.
- W. Orient boxes to accommodate wiring devices oriented as specified in Section 26 27 26.
- X. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
- Y. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.
- Z. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.
- AA. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.
- BB. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
- CC. Support boxes independently of conduit, except cast box that is connected to two rigid metal conduits both supported within 12 inches of box.
- DD. Use gang box where more than one device is mounted together. Do not use sectional box.
- EE. Use gang box with plaster ring for single device outlets.

### 3.03 CLEANING

- A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

### 3.04 PROTECTION

- A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION

SECTION 26 05 48  
VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Vibration isolation requirements.
- B. Seismic control requirements.
  - 1. Includes requirements for seismic qualification of equipment not specified in this section.
- C. Vibration-isolated equipment support bases.
- D. Vibration isolators.
- E. External seismic snubber assemblies.
- F. Anchoring and seismic restraint systems.

**1.02 RELATED REQUIREMENTS**

- A. Section 26 05 00 - Common Work Results for Electrical.
- B. Section 26 05 29 - Hangers and Supports for Electrical Systems.

**1.03 DEFINITIONS**

- A. Electrical Component: Where referenced in this section in regards to seismic controls, applies to any portion of the electrical system subject to seismic evaluation in accordance with applicable codes, including distributed systems (e.g., conduit, cable tray).
- B. Seismic Restraint: Structural members or assemblies of members or manufactured elements specifically designed and applied for transmitting seismic forces between components and the seismic force-resisting system of the structure.

**1.04 REFERENCE STANDARDS**

- A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.
- B. ASCE 19 - Structural Applications of Steel Cables for Buildings; 2016.

- C. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; Most Recent Edition Cited by Referring Code or Reference Standard.
- D. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2022.
- E. FEMA 413 - Installing Seismic Restraints for Electrical Equipment; 2004.
- F. FEMA E-74 - Reducing the Risks of Nonstructural Earthquake Damage; 2012.
- G. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. ICC-ES AC156 - Acceptance Criteria for Seismic Certification by Shake-Table Testing of Nonstructural Components; 2010, with Editorial Revision (2020).
- I. MFMA-4 - Metal Framing Standards Publication; 2004.
- J. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- L. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; 2024.

#### 1.05 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate selection and arrangement of vibration isolation and/or seismic control components with the actual equipment to be installed.
  - 2. Coordinate the work with other trades to provide additional framing and materials required for installation.
  - 3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
  - 4. Seismic Controls:
    - a. Coordinate the arrangement of seismic restraints with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.

- b. Coordinate the work with other trades to accommodate relative positioning of essential and nonessential components in consideration of seismic interaction.

- 5. Notify LP Consulting Engineers, Inc. of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

#### 1.06 SUBMITTALS

- A. See Section 01 33 00 for submittal procedures.
- B. Design Documents: Prepare and submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, details, and calculations.
- C. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.
  - 1. Vibration Isolators: Include rated load capacities and deflections; include information on color coding or other identification methods for spring element load capacities.
  - 2. Seismic Controls: Include seismic load capacities.
- D. Shop Drawings - Vibration Isolation Systems:
  - 1. Include dimensioned plan views and sections indicating proposed arrangement of vibration isolators; indicate equipment weights and static deflections.
  - 2. Vibration-Isolated Equipment Support Bases: Include base weights, including concrete fill where applicable; indicate equipment mounting provisions.
- E. Shop Drawings - Seismic Controls:
  - 1. Include dimensioned plan views and sections indicating proposed electrical component locations and distributed system routing, with locations and details of gravity supports and seismic restraints and associated attachments.
  - 2. Identify mounting conditions required for equipment seismic qualification.
  - 3. Identify anchor manufacturer, type, minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
  - 4. Indicate proposed arrangement of distributed system trapeze support groupings.

5. Indicate proposed locations for distributed system flexible fittings and/or connections.
6. Indicate locations of seismic separations where applicable.
7. Include point load drawings indicating design loads transmitted to structure at each attachment location.

F. Seismic Design Data:

1. Compile information on project-specific characteristics of actual installed electrical components necessary for determining seismic design forces required to design appropriate seismic controls, including but not limited to the following.
    - a. Component operating weight and center of gravity.
    - b. Component elevation in the building in relation to the roof elevation (z/h).
    - c. Component importance factor ( $I_p$ ).
    - d. For distributed systems, component materials and connection methods.
    - e. Component amplification factor ( $a_p$ ) and component response modification factor ( $R_p$ ), determined in accordance with ASCE 7 tables.
    - f. Applicability of overstrength factor (for certain anchorage in concrete and masonry).
  2. Include structural calculations, stamped or sealed by seismic controls designer, demonstrating suitability of seismic controls for seismic design forces.
- G. Certification for seismically qualified equipment; identify basis for certification.
- H. Evaluation Reports: For products specified as requiring evaluation and recognition by a qualified evaluation service, provide current evaluation reports.
- I. 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.
- J. Evidence of qualifications for seismic controls designer.
- K. Evidence of qualifications for manufacturer.

L. Manufacturer's detailed field testing and inspection procedures.

M. Field quality control test reports.

#### 1.07 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Comply with applicable building code.

C. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

D. Seismic Controls Designer Qualifications: Registered professional engineer licensed in California and with minimum five years experience designing seismic restraints for nonstructural components.

1. Designer may be employed by the manufacturer of the seismic restraint products.

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

#### 1.08 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

### PART 2 PRODUCTS

#### 2.01 VIBRATION ISOLATION REQUIREMENTS

A. Design and provide vibration isolation systems to reduce vibration transmission to supporting structure from vibration-producing electrical equipment and/or electrical connections to vibration-isolated equipment.

B. Comply with applicable general recommendations of ASHRAE (HVACA), where not in conflict with other specified requirements:

C. General Requirements:

1. Select vibration isolators to provide required static deflection.

2. Select vibration isolators for uniform deflection based on distributed operating weight of actual installed equipment.

3. Select seismic type vibration isolators to comply with seismic design requirements, including conditions of equipment seismic certification where applicable.
4. Select vibration-isolated equipment support bases and associated vibration isolators to provide minimum 2-inch operating clearance beneath base unless otherwise indicated.

D. Conduit Isolation:

1. Use flexible conduit or cable for electrical connections to vibration-isolated equipment, including equipment installed under other sections or by others.
  - a. Minimum Length: 3 feet unless otherwise indicated.
2. Vibration Isolators:
  - a. Provide vibration isolators for conduit supports:
    - 1) Located within 50 feet of connected vibration-isolated equipment where flexible connection to equipment is not possible.
    - 2) For conduits over 2 inch trade size located below or within 50 feet of noise-sensitive areas indicated.
  - b. Minimum Static Deflection:
    - 1) First Three Supports Closest to Isolated Equipment: Same as static deflection of equipment; maximum of 2 inch deflection required.
    - 2) Remainder of Supports: 0.75 inch deflection unless otherwise indicated.
  - c. Suspended Conduits, Nonseismic Applications: Use resilient material isolator hangers, spring isolator hangers, or combination resilient material/spring isolator hangers.
  - d. Suspended Conduits, Seismic Applications: Use seismic type resilient material isolator hangers, seismic type spring isolator hangers, or seismic type combination resilient material/spring isolator hangers.
  - e. Use modular seal or approved resilient material where vibration-isolated conduits penetrate building elements (e.g., walls, floors) arranged to prevent vibration transmission to structure.

2.02 SEISMIC CONTROL REQUIREMENTS

- A. Design and provide electrical component restraints, supports, and attachments suitable for seismic loads determined in accordance with applicable codes, as well as gravity and operating loads and other structural design considerations of the installed location. Consider wind loads for outdoor electrical components.
- B. Seismic Design Criteria: ICC (IBC).
- C. Component Importance Factor (Ip): Electrical components to be assigned a component importance factor (Ip) of 1.5 unless otherwise indicated.
- D. Seismic Qualification of Equipment:
  - 1. Provide special certification for electrical equipment furnished under other sections and assigned a component importance factor (Ip) of 1.5, certifying that equipment will remain operable following a design level earthquake.
  - 2. Seismic qualification to be by shake table testing in accordance with recognized testing standard procedure, such as ICC-ES AC156, acceptable to authorities having jurisdiction.
  - 3. Notify LP Consulting Engineers, Inc. and obtain direction where mounting restrictions required by conditions of seismic certification conflict with specified requirements.
  - 4. Seismically qualified equipment to be furnished with factory-installed labels referencing certificate of compliance and associated mounting restrictions.
- E. Seismic Restraints:
  - 1. Provide seismic restraints for electrical components except where exempt according to applicable codes and specified seismic design criteria, as approved by authorities having jurisdiction.
  - 2. Comply with applicable general recommendations of the following, where not in conflict with applicable codes, seismic design criteria, or other specified requirements:
    - a. ASHRAE (HVACA).
    - b. FEMA 413.
    - c. FEMA E-74.
    - d. SMACNA (SRM).

3. Seismic restraint capacities to be verified by a Nationally Recognized Testing Laboratory (NRTL) or certified by an independent third-party registered professional engineer acceptable to authorities having jurisdiction.
4. Seismic Type Vibration Isolators:
  - a. Comply with seismic design requirements, including conditions of equipment seismic certification where applicable.
5. External Seismic Snubber Assemblies:
  - a. Provide quantity and arrangement of external seismic snubber assemblies as required to restrain equipment in all directions (both lateral and vertical).
  - b. Do not use external seismic snubber assemblies that restrain equipment only in one or more lateral directions (but not vertical) except where uplift forces are zero or are addressed by other restraints.
6. Seismic Restraint Systems:
  - a. Except where otherwise restricted, use of either cable or rigid restraints is permitted.
  - b. Use only cable restraints to restrain vibration-isolated electrical components, including distributed systems.
  - c. Use only one restraint system type for a given electrical component or distributed system (e.g., conduit, cable tray) run; mixing of cable and rigid restraints on a given component/run is not permitted.
  - d. Size restraint elements, including anchorage, to resist seismic loads as necessary to restrain electrical component in all lateral directions; consider bracket geometry in anchor load calculations.
  - e. Use rod stiffener clips to attach bracing to hanger rods as required to prevent rod buckling from vertical (upward) compressive load introduced by cable or rigid restraints loaded in tension, in excess of downward tensile load due to supported electrical component weight.
  - f. Select hanger rods and associated anchorage as required to accommodate vertical (downward) tensile load introduced by rigid restraints loaded in compression, in addition to downward tensile load due to supported electrical component weight.

- g. Clevis hangers may only be used for attachment of transverse restraints; do not use for attachment of longitudinal restraints.
- h. Where seismic restraints are attached to clevis hangers, provide clevis bolt reinforcement accessory to prevent clevis hanger deformation.
- i. Do not introduce lateral loads on open bar joist chords or the weak axis of beams, or loads in any direction at other than panel points unless approved by project Structural Engineer of Record.
- j. Manufacturer's certified seismic restraint design may be submitted as an alternative to project-specific design and documentation, subject to approval of authorities having jurisdiction.

F. Seismic Attachments:

- 1. Attachments to be bolted, welded, or otherwise positively fastened without consideration of frictional resistance produced by the effects of gravity.
- 2. Do not use power-actuated fasteners.
- 3. Do not use friction clips (devices that rely on mechanically applied friction to resist loads). Beam clamps may be used for supporting sustained loads where provided with restraining straps.
- 4. Comply with anchor minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.

G. Seismic Interactions:

- 1. Include provisions to prevent seismic impact between electrical components and other structural or nonstructural components.
- 2. Include provisions such that failure of a component, either essential or nonessential, does not cause the failure of an essential component.
- 3. Comply with minimum clearance requirements between electrical equipment, distribution systems, and associated supports and fire protection sprinkler system drops and sprigs.

H. Seismic Relative Displacement Provisions:

- 1. Use suitable fittings or flexible connections to accommodate:

- a. Relative displacements at connections between components, including distributed systems (e.g., conduit, cable tray); do not exceed load limits for equipment utility connections.
  - b. Relative displacements between component supports attached to dissimilar parts of structure that may move differently during an earthquake.
  - c. Design displacements at seismic separations.
  - d. Anticipated drifts between floors.
2. Include provisions to prevent interruption of utility service due to seismic displacements.

## 2.03 VIBRATION-ISOLATED EQUIPMENT SUPPORT BASES

### A. Manufacturers:

1. Vibration-Isolated Equipment Support Bases:
  - a. Kinetics Noise Control, Inc: [www.kineticsnoise.com/#sle](http://www.kineticsnoise.com/#sle).
  - b. Mason Industries: [www.mason-ind.com/#sle](http://www.mason-ind.com/#sle).
  - c. Vibration Eliminator Company, Inc: [www.veco-nyc.com/#sle](http://www.veco-nyc.com/#sle).
2. Substitutions: See Section 01 60 00 - Product Requirements.
3. Source Limitations: Furnish vibration-isolated equipment support bases and associated components and accessories produced by the same manufacturer as the vibration isolators and obtained from a single supplier.

### B. Vibration-Isolated Structural Steel Bases:

1. Description: Engineered structural steel frames with integral mounting provisions for vibration isolators, sized and configured for mounting of equipment.

### C. Vibration-Isolated Concrete Inertia Bases:

1. Description: Concrete-filled engineered steel forms with integral mounting provisions for vibration isolators, sized and configured for mounting of equipment.
2. Minimum Base Depth: 6 inches.

3. Minimum Base Mass (Including Concrete): 1.5 times weight of supported equipment.

## 2.04 VIBRATION ISOLATORS

### A. Manufacturers:

1. Vibration Isolators:
  - a. Kinetics Noise Control, Inc: [www.kineticsnoise.com/#sle](http://www.kineticsnoise.com/#sle).
  - b. Mason Industries: [www.mason-ind.com/#sle](http://www.mason-ind.com/#sle).
  - c. Vibration Eliminator Company, Inc: [www.veco-nyc.com/#sle](http://www.veco-nyc.com/#sle).
  - d. Korfund Dynamics Corp.
  - e. Amber-Booth Co.
  - f. Consolidated Kinetics.
  - g. Or approved equal.
2. Substitutions: See Section 01 60 00 - Product Requirements.
3. Source Limitations: Furnish vibration-isolators and associated accessories produced by a single manufacturer and obtained from a single supplier.

### B. General Requirements:

1. Resilient Materials for Vibration Isolators: Oil, ozone, and oxidant resistant.
2. Spring Elements for Spring Isolators:
  - a. Color code or otherwise identify springs to indicate load capacity.
  - b. Lateral Stability: Minimum lateral stiffness to vertical stiffness ratio of 0.8.
  - c. Designed to operate in the linear portion of their load versus deflection curve over deflection range of not less than 50 percent above specified deflection.
  - d. Designed to provide additional travel to solid of not less than 50 percent of rated deflection at rated load.

- e. Selected to provide designed deflection of not less than 75 percent of specified deflection.
  - f. Selected to function without undue stress or overloading.
- 3. Seismic Snubbing Elements for Seismic Isolators:
  - a. Air Gap: Between 0.125 inches and 0.25 inches unless otherwise indicated.
  - b. Points of Contact: Cushioned with resilient material, minimum 0.25 inch thick; capable of being visually inspected for damage and replaced.
- C. Vibration Isolators for Nonseismic Applications:
  - 1. Resilient Material Isolator Pads:
    - a. Description: Single or multiple layer pads utilizing elastomeric (e.g., neoprene, rubber) or fiberglass isolator material.
    - b. Pad Thickness: As required for specified minimum static deflection; minimum 0.25 inch thickness.
    - c. Multiple Layer Pads: Provide bonded, galvanized sheet metal separation plate between each layer.
  - 2. Resilient Material Isolator Mounts, Nonseismic:
    - a. Description: Mounting assemblies for bolting equipment to supporting structure utilizing elastomeric (e.g., neoprene, rubber) or fiberglass isolator material; fail-safe type.
  - 3. Open (Unhoused) Spring Isolators:
    - a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) without a housing.
    - b. Bottom Load Plate: Nonskid, molded, elastomeric isolator material or steel with nonskid elastomeric isolator pad with provisions for bolting to supporting structure as required.
    - c. Furnished with integral leveling device for positioning and securing supported equipment.
  - 4. Housed Spring Isolators:

- a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) within a metal housing.
  - b. Furnished with integral elastomeric snubbing elements, nonadjustable type, for limiting equipment movement and preventing metal-to-metal contact between housing elements.
  - c. Bottom Load Plate: Steel with nonskid, elastomeric isolator pad with provisions for bolting to supporting structure as required.
  - d. Furnished with integral leveling device for positioning and securing supported equipment.
5. Restrained Spring Isolators, Nonseismic:
- a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) within a metal housing designed to prevent movement of supported equipment above an adjustable vertical limit stop.
  - b. Bottom Load Plate: Steel with nonskid, elastomeric isolator pad with provisions for bolting to supporting structure as required.
  - c. Furnished with integral leveling device for positioning and securing supported equipment.
  - d. Provides constant free and operating height.
6. Resilient Material Isolator Hangers, Nonseismic:
- a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing elastomeric (e.g., neoprene, rubber) or fiberglass isolator material for the lower hanger rod connection.
7. Spring Isolator Hangers, Nonseismic:
- a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) in series with an elastomeric element for the lower hanger rod connection.
  - b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.
8. Combination Resilient Material/Spring Isolator Hangers, Nonseismic:

- a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) for the lower hanger rod connection and elastomeric (e.g., neoprene, rubber) or fiberglass isolator material for the upper hanger rod connection.
- b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.

D. Vibration Isolators for Seismic Applications:

1. Resilient Material Isolator Mounts, Seismic:

- a. Description: Mounting assemblies for bolting equipment to supporting structure utilizing elastomeric (e.g., neoprene, rubber) isolator material; specifically designed and rated for seismic applications with integral snubbing in all directions.

2. Restrained Spring Isolators, Seismic:

- a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) in series with elastomeric (e.g., neoprene, rubber) isolator material within a metal housing designed to prevent movement of supported equipment above an adjustable vertical limit stop; specifically designed and rated for seismic applications with integral snubbing in all directions.
- b. Bottom Load Plate: Steel with provisions for bolting to supporting structure as required.
- c. Furnished with integral leveling device for positioning and securing supported equipment.
- d. Provides constant free and operating height.

3. Resilient Material Isolator Hangers, Seismic:

- a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing elastomeric (e.g., neoprene, rubber) isolator material for the lower hanger rod connection; specifically designed and rated for seismic applications with vertical limit stop to prevent upward travel of hanger rod and cushion impact.

4. Spring Isolator Hangers, Seismic:
  - a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) in series with an elastomeric element for the lower hanger rod connection; specifically designed and rated for seismic applications with vertical limit stop to prevent upward travel of hanger rod and cushion impact.
  - b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.
5. Combination Resilient Material/Spring Isolator Hangers, Seismic:
  - a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) for the lower hanger rod connection and elastomeric (e.g., neoprene, rubber) isolator material for the upper hanger rod connection; specifically designed and rated for seismic applications with vertical limit stop to prevent upward travel of hanger rod and cushion impact.
  - b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.

## 2.05 EXTERNAL SEISMIC SNUBBER ASSEMBLIES

### A. Manufacturers:

1. External Seismic Snubber Assemblies:
  - a. Kinetics Noise Control, Inc: [www.kineticsnoise.com/#sle](http://www.kineticsnoise.com/#sle).
  - b. Mason Industries: [www.mason-ind.com/#sle](http://www.mason-ind.com/#sle).
  - c. Vibration Eliminator Company, Inc: [www.veco-nyc.com/#sle](http://www.veco-nyc.com/#sle).
2. Substitutions: See Section 01 60 00 - Product Requirements.
3. Source Limitations: Furnish external seismic snubber assemblies and associated accessories produced by the same manufacturer as the vibration isolators and obtained from a single supplier.

- B. Description: Steel snubbing assemblies designed for external attachment to both equipment and supporting structure that, as part of a complete system, restrain

equipment motion in all directions during a seismic event while maintaining vibration isolation during normal operation.

C. Seismic Snubbing Elements:

1. Air Gap: Between 0.125 inches and 0.25 inches unless otherwise indicated.
2. Points of Contact: Cushioned with resilient material, minimum 0.25 inch thick; capable of being visually inspected for damage and replaced.

2.06 SEISMIC RESTRAINT SYSTEMS

A. Manufacturers:

1. Seismic Restraint Systems:
  - a. AFCON, a brand of Anvil International: [www.anvilintl.com/#sle](http://www.anvilintl.com/#sle).
  - b. Eaton Corporation: [www.eaton.com/#sle](http://www.eaton.com/#sle).
  - c. Kinetics Noise Control, Inc: [www.kineticsnoise.com/#sle](http://www.kineticsnoise.com/#sle).
  - d. Mason Industries: [www.mason-ind.com/#sle](http://www.mason-ind.com/#sle).
2. Substitutions: See Section 01 60 00 - Product Requirements.
3. Source Limitations: Furnish seismic restraint system components and accessories produced by a single manufacturer and obtained from a single supplier.

B. Description: System components and accessories specifically designed for field assembly and attachment of seismic restraints.

C. Cable Restraints:

1. Comply with ASCE 19.
2. Cables: Pre-stretched, galvanized steel wire rope with certified break strength.
3. Cable Connections: Use only swaged end fittings. Cable clips and wedge type end fittings are not permitted in accordance with ASCE 19.
4. Use protective thimbles for cable loops where potential for cable damage exists.

D. Rigid Restraints: Use MFMA-4 steel channel (strut), steel angle, or steel pipe for structural element; suitable for both compressive and tensile design loads.

**PART 3 EXECUTION****3.01 EXAMINATION**

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.
- C. Verify that conditions are satisfactory for installation prior to starting work.

**3.02 CODE-REQUIRED SPECIAL INSPECTIONS**

- A. Frequency of Special Inspections: Where special inspections are designated as continuous or periodic, arrange work accordingly.
  - 1. Continuous Special Inspections: Special Inspection Agency to be present in the area where the work is being performed and observe the work at all times the work is in progress.
  - 2. Periodic Special Inspections: Special Inspection Agency to be present in the area where work is being performed and observe the work part-time or intermittently and at the completion of the work.
- B. Prior to starting work, to submit written statement of responsibility to authorities having jurisdiction and to Owner acknowledging awareness of special requirements contained in the statement of special inspections.
- C. Special Inspection Agency services do not relieve from performing inspections and testing specified elsewhere.

**3.03 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Install products in accordance with applicable requirements of NECA 1 (general workmanship).
- C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- D. Secure fasteners according to manufacturer's recommended torque settings.
- E. Install flexible conduit and cable connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

F. Vibration Isolation Systems:

1. Vibration-Isolated Equipment Support Bases:
  - a. Provide specified minimum clearance beneath base.
2. Spring Isolators:
  - a. Position equipment at operating height; provide temporary blocking as required.
  - b. Lift equipment free of isolators prior to lateral repositioning to avoid damage to isolators.
  - c. Level equipment by adjusting isolators gradually in sequence to raise equipment uniformly such that excessive weight or stress is not placed on any single isolator.
3. Isolator Hangers:
  - a. Use precompressed isolator hangers where required to facilitate installation and prevent damage to equipment utility connection provisions.
  - b. Locate isolator hangers at top of hanger rods in accordance with manufacturer's instructions.
4. Clean debris from beneath vibration-isolated equipment that could cause short-circuiting of isolation.
5. Use elastomeric grommets for attachments where required to prevent short-circuiting of isolation.
6. Adjust isolators to be free of isolation short circuits during normal operation.
7. Do not overtighten fasteners such that resilient material isolator pads are compressed beyond manufacturer's maximum recommended deflection.

G. Seismic Controls:

1. Provide specified snubbing element air gap; remove any factory-installed spacers, debris or other obstructions.
2. Use only specified components, anchorage, and hardware evaluated by seismic design. Comply with conditions of seismic certification where applicable.

3. Where mounting hole diameter exceeds bolt diameter by more than 0.125 inch, use epoxy grout, elastomeric grommet, or welded washer to reduce clearance to 0.125 inch or less.
4. Equipment with Sheet Metal Housings:
  - a. Use Belleville washers to distribute stress over a larger surface area of the sheet metal connection interface as approved by manufacturer.
  - b. Attach additional steel as approved by manufacturer where required to transfer loads to structure.
  - c. Where mounting surface is irregular, do not shim housing; reinforce housing with additional steel as approved by manufacturer.
5. Seismic Restraint Systems:
  - a. Do not attach seismic restraints and gravity supports to dissimilar parts of structure that may move differently during an earthquake.
  - b. Install restraints within permissible angles in accordance with seismic design.
  - c. Install cable restraints straight between component/run and structural attachment; do not bend around other nonstructural components or structural elements.
  - d. Install cable restraints for vibration-isolated components slightly slack to prevent short-circuiting of isolation.
  - e. Install hanger rod stiffeners where indicated using only specified clamps; do not weld stiffeners to hanger rod.

### 3.04 FIELD QUALITY CONTROL

- A. Inspect vibration isolation and/or seismic control components for damage and defects.
- B. Provide services of a manufacturer's authorized representative for vibration isolation systems and seismic controls to observe installation and assist in inspection and testing. Include manufacturer's detailed testing and inspection procedures and field reports with submittals.
- C. Vibration Isolation Systems:

1. Verify isolator static deflections.
2. Verify required clearance beneath vibration-isolated equipment support bases.
3. Verify vibration isolation performance during normal operation; investigate sources of isolation short circuits.

D. Seismic Controls:

1. Verify snubbing element air gaps.
- E. Correct deficiencies and replace damaged or defective vibration isolation and/or seismic control components.
- F. Submit detailed reports indicating inspection and testing results and corrective actions taken.

3.05 ATTACHMENTS

- A. Statement of special inspections.

END OF SECTION

SECTION 26 05 53  
IDENTIFICATION FOR ELECTRICAL SYSTEMS

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Electrical identification requirements.
- B. Identification nameplates and labels.
- C. Wire and cable markers.
- D. Voltage markers.
- E. Floor marking tape.
- F. Warning signs and labels.
- G. Field-painted identification of conduit.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 00 – Common Work Results for Electrical.
- B. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.
- C. Section 26 27 26 - Wiring Devices: Device and wallplate finishes; factory pre-marked wallplates.

1.03 REFERENCE STANDARDS

- A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs; 2023.
- B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2023.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. NFPA 70E - Standard for Electrical Safety in the Workplace; 2024.
- E. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.

B. Sequencing:

1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
2. Do not install identification products until final surface finishes and painting are complete.

1.05 SUBMITTALS

A. See Section 01 33 00 for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.

C. Shop Drawings: Provide schedule of items to be identified indicating proposed designations, materials, legends, and formats.

D. Samples:

1. Identification Nameplates: One of each type and color specified.
2. Warning Signs and Labels: One of each type and legend specified.

E. 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.

1.06 QUALITY ASSURANCE

A. Conform to requirements of CEC.

B. Conform to requirements of NFPA 70.

C. Furnish products listed and classified by UL as suitable for the purpose specified and shown.

1.07 FIELD CONDITIONS

A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

## **PART 2 PRODUCTS**

### **2.01 IDENTIFICATION REQUIREMENTS**

- A. Existing Work: Unless specifically excluded, identify existing elements to remain that are not already identified in accordance with specified requirements.
- B. Identification for Equipment:
  - 1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
    - a. Panelboards:
      - 1) Identify ampere rating.
      - 2) Identify voltage and phase.
      - 3) Identify power source and circuit number. Include location when not within sight of equipment.
      - 4) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.
      - 5) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
      - 6) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
    - b. Enclosed switches and circuit breakers:
      - 1) Identify voltage and phase.
      - 2) Identify power source and circuit number. Include location when not within sight of equipment.
      - 3) Identify load(s) served. Include location when not within sight of equipment.
    - c. Time Switches:
      - 1) Identify load(s) served and associated circuits controlled. Include location.

- d. Enclosed Contactors:
  - 1) Identify ampere rating.
  - 2) Identify voltage and phase.
  - 3) Identify configuration, e.g., E.O.E.H. (electrically operated, electrically held) or E.O.M.H. (electrically operated, mechanically held).
  - 4) Identify coil voltage.
  - 5) Identify load(s) and associated circuits controlled. Include location.
- e. Centralized Emergency Lighting Inverters:
  - 1) Identify input and output voltage and phase.
  - 2) Identify power source and circuit number for normal power source. Include location when not within sight of equipment.
  - 3) Identify load(s) served. Include location.
- 2. Use voltage marker to identify highest voltage present for each piece of electrical equipment.
- 3. Use identification nameplate to identify equipment utilizing series ratings, where permitted, in accordance with NFPA 70.
- 4. Use identification nameplate to identify switchboards and panelboards utilizing a high leg delta system in accordance with NFPA 70.
- 5. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.
- 6. Use identification label or handwritten text using indelible marker on inside of door at each fused switch to identify required NEMA fuse class and size.
- 7. Use identification label or handwritten text using indelible marker on inside of door at each motor controller to identify nameplate horsepower, full load amperes, code letter, service factor, voltage, and phase of motor(s) controlled.
- 8. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".

9. Use field-painted floor markings, floor marking tape, or warning labels to identify required equipment working clearances where indicated or where required by the authority having jurisdiction.
  10. Use warning signs to identify electrical hazards for entrances to all rooms and other guarded locations that contain exposed live parts operating at 600 V nominal or less with the word message "DANGER; Electrical hazard; Authorized personnel only" or approved equivalent.
  11. Use warning signs to identify electrical hazards for entrances to all buildings, vaults, rooms, or enclosures containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".
  12. Use warning labels to identify electrical hazards for equipment, compartments, and enclosures containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".
  13. Use warning labels, identification nameplates, or identification labels to identify electrical hazards for equipment where multiple power sources are present with the word message "DANGER; Hazardous voltage; Multiple power sources may be present; Disconnect all electric power including remote disconnects before servicing" or approved equivalent.
- C. Identification for Conductors and Cables:
1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 05 19.
  2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
  3. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
    - a. At each source and load connection.
    - b. Within boxes when more than one circuit is present.

- c. Within equipment enclosures when conductors and cables enter or leave the enclosure.
- 4. Use wire and cable markers to identify connected grounding electrode system components for grounding electrode conductors.
- 5. Use underground warning tape to identify direct buried cables.

D. Identification for Raceways:

- 1. Use voltage markers to identify highest voltage present for accessible conduits at maximum intervals of 20 feet.
- 2. Use voltage markers, color-coded bands, or factory-painted conduits to identify systems other than normal power system for accessible conduits.
  - a. Maximum Intervals: 20 feet.
  - b. Color-Coded Bands: Use field-painting or vinyl color coding electrical tape to mark bands 3 inches wide.
    - 1) Vinyl Color Coding Electrical Tape: Comply with Section 26 05 19.
- 3. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify circuits enclosed for accessible conduits at wall penetrations, at floor penetrations, at roof penetrations, and at equipment terminations when source is not within sight.
- 4. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify spare conduits at each end. Identify purpose and termination location.
- 5. Use underground warning tape to identify underground raceways.
- 6. Use voltage markers to identify highest voltage present for wireways at maximum intervals of 20 feet.

E. Identification for Boxes:

- 1. Use voltage markers to identify highest voltage present.
- 2. Use voltage markers or color coded boxes to identify systems other than normal power system.
- 3. Use identification labels or handwritten text using indelible marker to identify circuits enclosed.. Install on back side of box cover.

- a. For exposed boxes in public areas, use only identification labels.
- 4. Use warning labels to identify electrical hazards for boxes containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".

F. Identification for Devices:

- 1. Wiring Device and Wallplate Finishes: Comply with Section 26 27 26.
- 2. Factory Pre-Marked Wallplates: Comply with Section 26 27 26.
- 3. Use identification label to identify fire alarm system devices.
  - a. For devices concealed above suspended ceilings, provide additional identification on ceiling tile below device location.
- 4. Use identification label or engraved wallplate to identify serving branch circuit for all receptacles.
  - a. For receptacles in public areas or in areas as directed by Architect, provide identification on inside surface of wallplate.
- 5. Use identification label or engraved wallplate to identify load controlled for wall-mounted control devices controlling loads that are not visible from the control location and for multiple wall-mounted control devices installed at one location.
- 6. Use identification label to identify receptacles protected by upstream GFI protection, where permitted.

G. Identification for Luminaires:

- 1. Use permanent red dot on luminaire frame to identify luminaires connected to emergency power system.

H. Buried Electrical Lines: Underground warning tapes.

I. Communication Cabinets: Nameplates.

J. Conduit: Conduit markers.

K. Control Device Station: Labels.

L. Electrical Distribution and Control Equipment Enclosures: Nameplates.

2.02 MANUFACTURERS

- A. Brady Corporation: [www.bradycorp.com](http://www.bradycorp.com).
- B. Seton Identification Products: [www.seton.com/aec](http://www.seton.com/aec).
- C. HellermannTyton: [www.hellermanntyton.com](http://www.hellermanntyton.com).
- D. E-Z Code by T&B.
- E. Pan-Code by Panduit.
- F. Or approved equal.
- G. Substitutions: See Section 01 60 00 - Product Requirements.

## 2.03 IDENTIFICATION NAMEPLATES AND LABELS

### A. Identification Nameplates:

#### 1. Manufacturers:

- a. Brimar Industries, Inc: [www.brimar.com/#sle](http://www.brimar.com/#sle).
- b. Kolbi Pipe Marker Co: [www.kolbipipemarkers.com/#sle](http://www.kolbipipemarkers.com/#sle).
- c. Seton Identification Products: [www.seton.com/#sle](http://www.seton.com/#sle).
- d. Or approved equal.
- e. Substitutions: See Section 01 60 00 - Product Requirements.

#### 2. Materials:

- a. Indoor Clean, Dry Locations: Use plastic nameplates.
- b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.

#### 3. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.

- a. Exception: Provide minimum thickness of 1/8 inch when any dimension is greater than 4 inches.

#### 4. Stainless Steel Nameplates: Minimum thickness of 1/32 inch; engraved or laser-etched text.

5. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch; engraved or laser-etched text.
6. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.

B. Identification Labels:

1. Manufacturers:
  - a. Brady Corporation: [www.bradyid.com/#sle](http://www.bradyid.com/#sle).
  - b. Brother International Corporation: [www.brother-usa.com/#sle](http://www.brother-usa.com/#sle).
  - c. Panduit Corp: [www.panduit.com/#sle](http://www.panduit.com/#sle).
  - d. Or approved equal.
  - e. Substitutions: See Section 01 60 00 - Product Requirements.
2. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
  - a. Use only for indoor locations.
3. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

C. Format for Equipment Identification:

1. Minimum Size: 1 inch by 2.5 inches.
2. Legend:
  - a. System designation where applicable:
    - 1) Emergency Power System: Identify with text "EMERGENCY".
  - b. Equipment designation or other approved description.
  - c. Other information as indicated.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height:
  - a. System Designation: 1/2 inch.

- b. Equipment Designation: 1/4 inch.
  - c. Other Information: 1/8 inch.
  - d. Exception: Provide minimum text height of 1 inch for equipment located more than 10 feet above floor or working platform.
- 5. Color:
  - a. Normal Power System: White text on black background.
    - 1) 480Y/277 V, 3 Phase Equipment: White text on orange background.
    - 2) 208Y/120 V, 3 Phase Equipment: White text on black background.
  - b. Emergency Power System: White text on red background.
- D. Format for General Information and Operating Instructions:
  - 1. Minimum Size: 1 inch by 2.5 inches.
  - 2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
  - 3. Text: All capitalized unless otherwise indicated.
  - 4. Minimum Text Height: 1/4 inch.
  - 5. Color: Black text on white background unless otherwise indicated.
    - a. Exceptions:
      - 1) Provide white text on red background for general information or operational instructions for emergency systems.
      - 2) Provide white text on red background for general information or operational instructions for fire alarm systems.
      - 3) Provide white text on black background for all other systems, unless noted otherwise.
- E. Format for Caution and Warning Messages:
  - 1. Minimum Size: 2 inches by 4 inches.
  - 2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.

3. Text: All capitalized unless otherwise indicated.
  4. Minimum Text Height: 1/2 inch.
  5. Color: Black text on yellow background unless otherwise indicated.
- F. Format for Receptacle Identification:
1. Minimum Size: 3/8 inch by 1.5 inches.
  2. Legend: Power source and circuit number or other designation indicated.
    - a. Include voltage and phase for other than 120 V, single phase circuits.
  3. Text: All capitalized unless otherwise indicated.
  4. Minimum Text Height: 3/16 inch.
  5. Color: Black text on clear background.
- G. Format for Control Device Identification:
1. Minimum Size: 3/8 inch by 1.5 inches.
  2. Legend: Load controlled or other designation indicated.
  3. Text: All capitalized unless otherwise indicated.
  4. Minimum Text Height: 3/16 inch.
  5. Color: Black text on clear background.
- H. Manufacturers:
1. Kolbi Pipe Marker Co.; Model: [www.kolbipipemarkers.com](http://www.kolbipipemarkers.com).
  2. Seton Identification Product; Model: [www.seton.com](http://www.seton.com).
  3. Or approved equal.
- I. Nameplates: Engraved three-layer laminated plastic, white letters on black background, unless noted otherwise on drawings or specifications.
- J. Locations:
1. Each electrical distribution and control equipment enclosure.
  2. Communication cabinets.

K. Letter Size:

1. Use 1/8 inch letters for identifying individual equipment and loads.
2. Use 1/4 inch letters for identifying grouped equipment and loads.

L. Labels: Embossed adhesive tape, with 3/16 inch white letters on black background.  
Use only for identification of individual wall switches and receptacles, control device stations.

2.04 WIRE AND CABLE MARKERS

A. Manufacturers:

1. Brady Corporation: [www.bradyid.com/#sle](http://www.bradyid.com/#sle).
2. Seton Identification Products: [www.seton.com](http://www.seton.com).
3. HellermannTyton: [www.hellermanntyton.com/#sle](http://www.hellermanntyton.com/#sle).
4. Panduit Corp: [www.panduit.com/#sle](http://www.panduit.com/#sle).
5. Or approved equal.
6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, or plastic sleeve type markers suitable for the conductor or cable to be identified.

C. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.

D. Legend: Power source and circuit number or other designation indicated.

E. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.

1. Do not use handwritten text.

F. Minimum Text Height: 1/8 inch.

G. Color: Black text on white background unless otherwise indicated.

H. Description: Vinyl cloth type self-adhesive wire markers.

I. Description: Cloth type wire markers.

J. Locations: Each conductor at panelboard gutters, pull boxes, outlet boxes, and junction boxes each load connection.

K. Legend:

1. Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.
2. Control Circuits: Control wire number indicated on schematic and interconnection diagrams on drawings.

## 2.05 VOLTAGE MARKERS

A. Manufacturers:

1. Brady Corporation: [www.bradyid.com/#sle](http://www.bradyid.com/#sle).
2. Brimar Industries, Inc: [www.brimar.com/#sle](http://www.brimar.com/#sle).
3. Seton Identification Products: [www.seton.com/#sle](http://www.seton.com/#sle).
4. HellermannTyton: [www.hellermannityton.com](http://www.hellermannityton.com).
5. Or approved equal.
6. Substitutions: See Section 01 60 00 - Product Requirements.

B. Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth, or vinyl snap-around type markers.

C. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.

D. Minimum Size:

1. Markers for Equipment: 1 1/8 by 4 1/2 inches.
2. Markers for Conduits: As recommended by manufacturer for conduit size to be identified.
3. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches.
4. Markers for Junction Boxes: 1/2 by 2 1/4 inches.

E. Legend:

1. Markers for Voltage Identification: Highest voltage present.

- 2. Markers for System Identification:
  - a. Emergency Power System: Text "EMERGENCY".
  - b. Other Systems: Type of service.
- F. Color: Black text on orange background unless otherwise indicated.
- G. Location: Furnish markers for each conduit longer than 6 feet.
- H. Spacing: 20 feet on center.
- I. Color:
  - 1. Fire Alarm System: Red.

## 2.06 FLOOR MARKING TAPE

- A. Manufacturers:
  - 1. Brady Corporation: [www.bradyid.com/#sle](http://www.bradyid.com/#sle).
  - 2. Brimar Industries, Inc: [www.brimar.com/#sle](http://www.brimar.com/#sle).
  - 3. Insite Solutions, LLC: [www.stop-painting.com/#sle](http://www.stop-painting.com/#sle).
  - 4. Seton Identification Products: [www.seton.com/#sle](http://www.seton.com/#sle).
  - 5. Or approved equal..
  - 6. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Floor Marking Tape for Equipment Working Clearance Identification: Self-adhesive vinyl or polyester tape with overlamine, 3 inches wide, with alternating black and white stripes.

## 2.07 WARNING SIGNS AND LABELS

- A. Manufacturers:
  - 1. Brimar Industries, Inc: [www.brimar.com/#sle](http://www.brimar.com/#sle).
  - 2. Clarion Safety Systems, LLC: [www.clarionsafety.com/#sle](http://www.clarionsafety.com/#sle).
  - 3. Insite Solutions, LLC: [www.stop-painting.com/#sle](http://www.stop-painting.com/#sle).
  - 4. Seton Identification Products: [www.seton.com/#sle](http://www.seton.com/#sle).

5. Or approved equal.
6. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.
- C. Warning Signs:
  1. Materials:
    - a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
    - b. Outdoor Locations: Use factory pre-printed rigid aluminum signs.
  2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.
  3. Minimum Size: 7 by 10 inches unless otherwise indicated.
- D. Warning Labels:
  1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
    - a. Do not use labels designed to be completed using handwritten text.
  2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
  3. Minimum Size: 2 by 4 inches unless otherwise indicated.
- E. Floor Signs:
  1. Materials: Use factory preprinted, self-adhesive vinyl, polyester, or rubber labels with protective overlamine; removable.
  2. Minimum Size: 17-inch diameter unless otherwise indicated.
- F. Description: 3 inch wide polyethylene tape, detectable type colored red with suitable warning legend describing buried electrical lines.
- G. Description: 4 inch wide plastic tape, detectable type colored red with suitable warning legend describing buried electrical lines.

### **PART 3 EXECUTION**

### 3.01 PREPARATION

- A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

### 3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
  - 1. Surface-Mounted Equipment: Enclosure front.
  - 2. Flush-Mounted Equipment: Inside of equipment door.
  - 3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
  - 4. Elevated Equipment: Legible from the floor or working platform.
  - 5. Branch Devices: Adjacent to device.
  - 6. Interior Components: Legible from the point of access.
  - 7. Conduits: Legible from the floor.
  - 8. Boxes: Outside face of cover.
  - 9. Conductors and Cables: Legible from the point of access.
  - 10. Devices: Outside face of cover.
- C. Install identification products centered, level, and parallel with lines of item being identified.
- D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
  - 1. Do not use adhesives on exterior surfaces except where substrate cannot be penetrated.
- E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
- F. Install underground warning tape above buried lines with one tape per trench at 3 inches below finished grade.

- G. Secure rigid signs using stainless steel screws.
- H. Mark all handwritten text, where permitted, to be neat and legible.

3.03 FIELD QUALITY CONTROL

- A. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION



SECTION 26 05 83  
WIRING CONNECTIONS

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Electrical connections to equipment.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 00 – Common Work Results for Electrical.
- B. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables.
- C. Section 26 05 33.13 - Conduit for Electrical Systems.
- D. Section 26 05 33.16 - Boxes for Electrical Systems.
- E. Section 26 27 26 - Wiring Devices.

1.03 REFERENCE STANDARDS

- A. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).
- B. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2021.
- C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 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.

1.05 SUBMITTALS

- A. See Section 01 33 00 for submittal procedures.
- B. Product Data: Provide wiring device manufacturer's catalog information showing dimensions, configurations, and construction.
- C. 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.

1.06 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Products: Listed, classified, and labeled as suitable for the purpose intended.
- C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

**PART 2 PRODUCTS**

2.01 MATERIALS

- A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
  - 1. Colors: Comply with NEMA WD 1.
  - 2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
  - 3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.
  - 4. Product: As noted on drawings or as required for the application.
  - 5. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Wiring Devices: As specified in Section 26 27 26.
- C. Flexible Conduit: As specified in Section 26 05 33.13.
- D. Wire and Cable: As specified in Section 26 05 19.
- E. Boxes: As specified in Section 26 05 33.16.

## 2.02 EQUIPMENT CONNECTIONS

### A. Connection Types and Ratings::

1. Electrical Connection: Flexible conduit, metallic or liquid tight flexible conduit as required by the application.
2. Electrical Connection: Cord and plug (Verify NEMA configuration and rating with equipment installer at jobsite).
3. Provide field-installed disconnect switch.
4. Voltage: Verify with equipment nameplate.
5. Load rating: Verify with equipment nameplate.
6. FLA: Verify with equipment nameplate.
7. WSA: Verify with equipment nameplate.
8. Branch Circuit: Verify with equipment nameplate.
9. Location: As indicated on drawings. Verify with equipment installer at jobsite.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that equipment is ready for electrical connection, wiring, and energization.

### 3.02 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.
- J. Coolers and Freezers: Cut and seal conduit openings in freezer and cooler walls, floor, and ceilings.

END OF SECTION

SECTION 26 09 23  
LIGHTING CONTROL DEVICES

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Occupancy sensors.
- B. Time switches.
- C. In-wall time switches.
- D. In-wall interval timers.
- E. Digital load controllers.
- F. Lighting contactors.
- G. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables.
- B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- C. Section 26 05 29 - Hangers and Supports for Electrical Systems
- D. Section 26 05 33.16 - Boxes for Electrical Systems.
- E. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- F. Section 26 27 26 - Wiring Devices: Devices for manual control of lighting, including wall switches, wall dimmers, and fan speed controllers.
  - 1. Includes finish requirements for wall controls specified in this section.
  - 2. Includes accessory receptacles, switches, dimmers and wall plates, to match lighting controls specified in this section.
- G. Section 26 51 00 - Interior Lighting.
- H. Section 28 46 00 - Fire Detection and Alarm.

1.03 REFERENCE STANDARDS

- A. 47 CFR 15 - Radio Frequency Devices; current edition.
- B. ANSI C136.10 - American National Standard for Roadway and Area Lighting Equipment - Locking-Type Photocontrol Devices and Mating Receptacles - Physical and Electrical Interchangeability and Testing; 2023.
- C. ANSI C136.24 - American National Standard for Roadway and Area Lighting Equipment - Nonlocking (Button) Type Photocontrols; 2020.
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- E. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.
- F. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.
- G. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2023.
- H. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2008 (Reaffirmed 2020).
- I. NEMA IA 10039 - Control Circuit and Pilot Devices; 2025.
- J. NEMA IA 10030 - Industrial Control and Systems: Enclosures; 2024.
- K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- L. UL 773 - Plug-in, Locking Type Photocontrols for Use with Area Lighting; Current Edition, Including All Revisions.
- M. UL 773A - Nonindustrial Photoelectric Switches for Lighting Control; Current Edition, Including All Revisions.
- N. UL 916 - Energy Management Equipment; Current Edition, Including All Revisions.
- O. UL 917 - Clock-Operated Switches; Current Edition, Including All Revisions.
- P. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.
- Q. UL 60947-1 - Low-Voltage Switchgear and Controlgear - Part 1: General Rules; Current Edition, Including All Revisions.
- R. UL 60947-4-1 - Low-Voltage Switchgear and Controlgear - Part 4-1: Contactors and Motor-starters - Electromechanical Contactors and Motor-starters; Current Edition, Including All Revisions.

#### 1.04 ADMINISTRATIVE REQUIREMENTS

##### A. Coordination:

1. Coordinate placement of lighting control devices with millwork, furniture, equipment and other potential conflicts.
2. Coordinate placement of wall switch occupancy sensors with installed door swings.
3. Coordinate placement of occupancy sensors with millwork, furniture, equipment and other potential obstructions to motion detection coverage.
4. Coordinate placement of photo sensors for daylighting controls with windows, skylights, and luminaires to achieve optimum operation. Coordinate placement with ductwork, piping, equipment, or other potential obstructions to light level measurement.
5. Coordinate lighting control device product selections with luminaire characteristics; see Section 26 51 00 and lighting fixture schedule.
6. Notify LP Consulting Engineers, Inc. of conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

##### B. Sequencing:

1. Do not install lighting control devices until final surface finishes and painting are complete.

#### 1.05 SUBMITTALS

##### A. See Section 01 33 00 for submittal procedures.

##### B. Product Data: Include ratings, operating modes or sequence of functions, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.

1. Occupancy Sensors: Include detailed motion detection coverage range diagrams.

##### C. Shop Drawings:

1. Occupancy Sensors: Provide lighting plan indicating location, model number, and orientation of each occupancy sensor and associated system component.

2. Digital Load Controllers: Provide dimensioned plan views indicating locations of system components, required clearances, and field connection locations. Include system interconnection schematic diagrams showing factory and field connections. Include manufacturer product characteristics and application instructions for wired and wireless applications, including start-up and commissioning.
  3. Daylighting Controls: Provide lighting plan indicating location, model number, and orientation of each photo sensor and associated system component.
- D. Samples:
1. Occupancy Sensors: One for each type and color specified.
  2. In-Wall Time Switches: One for each type and color specified.
  3. In-Wall Interval Timers: One for each type and color specified.
  4. Daylighting Control Photo Sensors: One for each type and color specified.
- E. Field quality control reports.
- F. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- G. Operation and Maintenance Data: Include detailed information on device programming and setup.
- H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 60 00 - Product Requirements, for additional provisions.
  2. Extra Locking Receptacle-Mounted Outdoor Photo Controls: Five percent of total quantity installed for each type, but not less than two of each type.
  3. Electronic Trip Circuit Breakers: Provide one portable test set.
  4. Indicating Lights: Two of each different type.
- I. Project Record Documents: Record actual installed locations and settings for lighting control devices.

1.06 QUALITY ASSURANCE

- A. Comply with NFPA 70.
- B. Maintain at project site one copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- D. Product Evaluation and Listing Organization Qualifications: Organization engaged in evaluation of products and services, including those recognized by OSHA as Nationally Recognized Testing Laboratories (NRTL), and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Store products in clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.08 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

- A. Provide five year manufacturer warranty for occupancy sensors.
- B. Provide five year manufacturer warranty for utility grade locking receptacle-mounted outdoor photo controls.
- C. Provide five year manufacturer warranty for digital load controllers.

**PART 2 PRODUCTS**

2.01 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled as suitable for purpose intended.
- B. Unless specifically indicated as excluded, provide components necessary for complete operating system including, but not limited to, conduit, wiring, connectors, hardware, and accessories.
- C. Products for Switching of Electronic Ballasts/Drivers: Tested and rated to be suitable for peak inrush currents specified in NEMA 410.

2.02 OCCUPANCY SENSORS

A. Manufacturers:

1. Acuity Brands, Inc: [www.acuitybrands.com/#sle](http://www.acuitybrands.com/#sle).
2. Hubbell Incorporated: [www.hubbell.com/#sle](http://www.hubbell.com/#sle).
3. Intermatic, Inc: [www.intermatic.com/#sle](http://www.intermatic.com/#sle).
4. Legrand North America, Inc: [www.legrand.us/#sle](http://www.legrand.us/#sle).
5. Lutron Electronics Company, Inc: [www.lutron.com/#sle](http://www.lutron.com/#sle).
6. RAB Lighting, Inc: [www.rablighting.com/#sle](http://www.rablighting.com/#sle).
7. Substitutions: See Section 01 60 00 - Product Requirements.
8. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.

B. General Requirements:

1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
2. Sensor Technology:
  - a. Passive Infrared (PIR) Occupancy Sensors: Designed to detect occupancy by sensing movement of thermal energy between zones.
  - b. Ultrasonic Occupancy Sensors: Designed to detect occupancy by sensing frequency shifts in emitted and reflected inaudible sound waves.
  - c. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using combination of both passive infrared and ultrasonic technologies.
  - d. Passive Infrared/Acoustic Dual Technology Occupancy Sensors: Designed to detect occupancy using combination of both passive infrared and audible sound sensing technologies.
3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.

4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during adjustable turn-off delay time interval.
5. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.
6. Passive Infrared Lens Field of View: Field customizable by addition of factory masking material, adjustment of integral blinders, or similar means to block motion detection in selected areas.
7. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.
8. Sensitivity: Field adjustable.
9. Adaptive Technology: Field selectable; capable of self-adjusting sensitivity and time delay according to conditions.
10. Integral Photocell: For field selectable and adjustable inhibition of automatic turn-on of load when ambient lighting is above selected level.
11. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.
12. Load Rating for Line Voltage Occupancy Sensors: As required to control load indicated on drawings.
13. Isolated Relay for Low Voltage Occupancy Sensors: SPDT dry contacts, ratings as required for interface with system indicated.
14. Where wired sensors are indicated, wireless sensors are acceptable provided that components and wiring modifications necessary for proper operation are included.
15. Wireless Sensors:
  - a. RF Range: 30 feet through typical construction materials.
  - b. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI)  
Limits: Comply with FCC requirements of 47 CFR 15, for Class B application.
  - c. Power: Battery-operated with minimum ten-year battery life.

C. Wall Switch Occupancy Sensors:

1. General Requirements:

- a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.
- b. Unless otherwise indicated or required to control load indicated on drawings, provide line voltage units with self-contained relay.
- c. Where indicated, provide two-circuit units for control of two separate lighting loads, with separate manual controls and separately programmable operation for each load.
- d. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).
- e. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during delayed-off time interval.
- f. Provide selectable audible alert to notify occupant of impending load turn-off.
- g. Finish: Match finishes specified for wiring devices in Section 26 27 26, unless otherwise indicated.
- h. Provide vandal resistant lenses for passive infrared (PIR) and dual technology wall switch occupancy sensors where indicated.

2. Passive Infrared (PIR) Wall Switch Occupancy Sensors: Capable of detecting motion within area of 900 square feet.

3. Ultrasonic Wall Switch Occupancy Sensors: Capable of detecting motion within area of 400 square feet.

4. Passive Infrared/Ultrasonic Dual Technology Wall Switch Occupancy Sensors: Capable of detecting motion within area of 900 square feet.

D. Wall Dimmer Occupancy Sensors:

1. General Requirements:

- a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with field of view of 180 degrees, integrated dimming control capability, and no leakage current to load in off mode.
  - b. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).
  - c. Manual-Off Override Control Capability: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during delayed-off time interval.
  - d. Dimmer: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, and listed as complying with UL 1472; type and rating suitable for load controlled.
  - e. Provide field adjustable dimming preset for occupied state.
  - f. Provide fade-to-off operation to notify occupant of impending load turn-off.
  - g. Finish: Match finishes specified for wiring devices in Section 26 27 26, unless otherwise indicated.
2. Passive Infrared (PIR) Wall Dimmer Occupancy Sensors: Capable of detecting motion within area of 900 square feet.
- E. Ceiling Mounted Occupancy Sensors:
- 1. General Requirements:
    - a. Description: Low profile occupancy sensors designed for ceiling installation.
    - b. Unless otherwise indicated or required to control load indicated on drawings, provide low voltage units, for use with separate compatible accessory power packs.
    - c. Provide field selectable setting for disabling LED motion detector visual indicator.
    - d. Occupancy sensor to be field selectable as either manual-on/automatic-off or automatic on/off.
    - e. Finish: White unless otherwise indicated.

2. Passive Infrared (PIR) Ceiling Mounted Occupancy Sensors:
    - a. Standard Range Sensors: Capable of detecting motion within area of 450 square feet at mounting height of 9 feet, with field of view of 360 degrees.
    - b. Extended Range Sensors: Capable of detecting motion within area of 1,200 square feet at mounting height of 9 feet, with field of view of 360 degrees.
  3. Ultrasonic Ceiling Mounted Occupancy Sensors:
    - a. Standard Range Sensors: Capable of detecting motion within area of 500 square feet at mounting height of 9 feet, with field of view of 360 degrees.
    - b. Medium Range Sensors: Capable of detecting motion within area of 1,000 square feet at mounting height of 9 feet, with field of view of 360 degrees.
    - c. Extended Range Sensors: Capable of detecting motion within area of 2,000 square feet at mounting height of 9 feet.
  4. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:
    - a. Standard Range Sensors: Capable of detecting motion within area of 450 square feet at mounting height of 9 feet, with field of view of 360 degrees.
    - b. Extended Range Sensors: Capable of detecting motion within area of 1,200 square feet at mounting height of 9 feet, with field of view of 360 degrees.
  5. Passive Infrared/Acoustic Dual Technology Ceiling Mounted Occupancy Sensors:
    - a. Standard Range Sensors: Capable of detecting motion within area of 450 square feet at mounting height of 9 feet, with field of view of 360 degrees.
    - b. Extended Range Sensors: Capable of detecting motion within area of 1,200 square feet at mounting height of 9 feet.
- F. Directional Occupancy Sensors:
1. General Requirements:
    - a. Description: Occupancy sensors designed for wall or ceiling mounting, with integral swivel for field adjustment of motion detection coverage.
    - b. Unless otherwise indicated or required to control the load indicated on drawings, provide low voltage units, for use with separate compatible accessory power packs.

- c. Provide field selectable setting for disabling LED motion detector visual indicator.
    - d. Finish: White unless otherwise indicated.
  - 2. Passive Infrared (PIR) Directional Occupancy Sensors:
    - a. Standard Range Sensors: Capable of detecting motion within distance of 40 feet at mounting height of 10 feet.
    - b. Long Range Sensors: Capable of detecting motion within distance of 80 feet at mounting height of 10 feet.
    - c. High Bay Sensors: Capable of detecting motion within distance of 50 feet at mounting height of 30 feet.
  - 3. Passive Infrared/Ultrasonic Dual Technology Directional Occupancy Sensors: Capable of detecting motion within distance of 40 feet at mounting height of 10 feet.
- G. Luminaire Mounted Occupancy Sensors: Designed for direct luminaire installation and control, suitable for use with specified luminaires.
  - 1. Fluorescent High Bay Luminaire Mounted Occupancy Sensors: Passive infrared (PIR) type with field of view of 360 degrees unless otherwise indicated.
    - a. Unless otherwise indicated or required to control load indicated on drawings, provide line voltage units with self-contained relay.
    - b. Finish: White unless otherwise indicated.
    - c. Circular Coverage Sensors: Capable of detecting motion within distance of 40 feet at mounting height of 20 feet.
    - d. Linear Aisle Coverage Sensors: Capable of detecting motion within area of 20 feet wide by 60 feet long at mounting height of 40 feet.
    - e. Accessories:
      - 1) Provide mounting bracket for lowering occupancy sensor such that luminaire does not block sensor field of view where required.
- H. Power Packs for Low-Voltage Occupancy Sensors:

1. Description: Plenum rated, self-contained low-voltage class 2 transformer and relay compatible with specified low-voltage occupancy sensors for switching of line-voltage loads.
  2. Provide quantity and configuration of power and slave packs with associated wiring and accessories as required to control load indicated on drawings.
  3. Input Supply Voltage: Dual rated for 120/277 V ac.
  4. Load Rating: As required to control load indicated on drawings.
- I. Power Packs for Wireless Occupancy Sensors:
1. Description: Plenum rated, self-contained relay compatible with specified wireless occupancy sensors for switching of line-voltage loads.
  2. Input Supply Voltage: Dual rated for 120/277 V ac.
  3. Load Rating: As required to control load indicated on drawings.
  4. Provide auxiliary contact closure output where indicated.
  5. Rated Life of Relay: One million cycles.
- J. Accessories:
1. Provide heavy duty coated steel wire protective guards compatible with specified occupancy sensors where indicated on plans.

## 2.03 TIME SWITCHES

### A. Manufacturers:

1. Intermatic, Inc: [www.intermatic.com/#sle](http://www.intermatic.com/#sle).
2. Tork, a division of NSI Industries LLC: [www.tork.com/#sle](http://www.tork.com/#sle).
3. Or approved equal.
4. Substitutions: See Section 01 60 00 - Product Requirements.
5. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.

### B. Digital Electronic Time Switches:

1. Description: Factory-assembled solid state programmable controller with LCD display, listed and labeled as complying with UL 916 or UL 917.
  2. Program Capability:
    - a. 24-Hour Time Switches: Single channel, with same schedule for each day of week and skip-a-day feature to omit selected days.
    - b. 7-Day Time Switches: Single channel, capable of different schedule for each day of week with additional holiday schedule available to override normal schedule for selected days.
    - c. Astronomic Time Switches: Single channel, capable of different schedule for each day of week with additional holiday schedule available to override normal schedule for selected days and field-configurable astronomic feature to automatically adjust for seasonal changes in sunrise and sunset times.
  3. Schedule Capacity: Not less than 16 programmable on/off operations.
  4. Provide automatic daylight savings time and leap year compensation.
  5. Provide power outage backup to retain programming and maintain clock.
  6. Manual override: Capable of overriding current schedule both permanently and temporarily until next scheduled event.
  7. Provide remote photocell input with light level adjustment.
  8. Input Supply Voltage: As indicated on the drawings.
  9. Output Switch Configuration: As required to control load indicated on drawings.
  10. Output Switch Contact Ratings: As required to control load indicated on drawings.
  11. Provide lockable enclosure; environmental type per NEMA EN 10250 as specified for the following installation locations:
    - a. Indoor clean, dry locations: Type 1.
    - b. Outdoor locations: Type 3R.
  12. Provide flush-mounted unit where indicated, where mounted in public areas, or where mounted adjacent to flush-mounted equipment.
- C. Electromechanical Time Switches:

1. Description: Factory-assembled controller with motor-operated timing dial mechanism and adjustable trippers for setting on/off operations, listed and labeled as complying with UL 917.
2. Program Capability:
  - a. 24-Hour Time Switches: With same schedule for each day of week and skip-a-day feature to omit selected days.
  - b. 7-Day Time Switches: Capable of different schedule for each day of week.
  - c. Astronomic Time Switches: With same schedule for each day of week and skip-a-day feature to omit selected days with automatic adjustment for seasonal changes in sunrise and sunset times.
3. Schedule Capacity:
  - a. 24-Hour Time Switches: Accommodating not less than 12 pairs of selected on/off operations per day.
  - b. 7-Day Time Switches: Accommodating not less than two pairs of selected on/off operations per day.
  - c. Astronomic Time Switches: Capable of turning load on at sunset and off at either sunrise or selected fixed time.
4. Provide spring reserve backup to maintain clock during power outage.
5. Manual override: Capable of overriding current schedule both permanently and temporarily until next scheduled event.
6. Input Supply Voltage: As indicated on the drawings.
7. Output Switch Configuration: As required to control load indicated on drawings.
8. Output Switch Contact Ratings: As required to control load indicated on drawings.
9. Provide lockable enclosure; environmental type per NEMA EN 10250 as specified for the following installation locations:
  - a. Indoor clean, dry locations: Type 1.
  - b. Outdoor locations: Type 3R.

10. Provide flush-mounted unit where indicated, where mounted in public areas, or where mounted adjacent to flush-mounted equipment.

## 2.04 IN-WALL TIME SWITCHES

### A. Manufacturers:

1. Intermatic, Inc: [www.intermatic.com/#sle](http://www.intermatic.com/#sle).
2. Tork, a division of NSI Industries LLC: [www.tork.com/#sle](http://www.tork.com/#sle).
3. Or approved equal.
4. Substitutions: See Section 01 60 00 - Product Requirements.
5. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.

### B. Digital Electronic In-Wall Time Switches:

1. Description: Factory-assembled solid state programmable controller with LCD display, suitable for mounting in standard wall box, and listed and labeled as complying with UL 916 or UL 917.
2. Program Capability:
  - a. 7-Day Time Switches: Capable of different schedule for each day of week.
  - b. Astronomic Time Switches: Capable of different schedule for each day of week and field-configurable astronomic feature to automatically adjust for seasonal changes in sunrise and sunset times.
3. Schedule Capacity: Not less than 40 programmable on/off operations.
4. Provide automatic daylight savings time compensation.
5. Provide power outage backup to retain programming and maintain clock.
6. Manual override: Capable of overriding current schedule both permanently and temporarily until next scheduled event.
7. Switch Configuration: Suitable for use in either SPST or 3-way application.
8. Contact Ratings: As required to control load indicated on drawings.

### C. Electromechanical In-Wall Time Switches:

1. Description: Factory-assembled controller with motor-operated timing dial mechanism and adjustable trippers for setting on/off operations, suitable for mounting in standard wall box, and listed and labeled as complying with UL 917.
2. Program Capability: 24-hour time switch with same schedule for each day of week.
3. Schedule Capacity: Accommodating not less than 24 selected on/off operations per day.
4. Manual override: Capable of permanently overriding current schedule.
5. Switch Configuration: SPST.
6. Contact Ratings: As required to control load indicated on drawings.

## 2.05 IN-WALL INTERVAL TIMERS

### A. Manufacturers:

1. Intermatic, Inc: [www.intermatic.com/#sle](http://www.intermatic.com/#sle).
2. Tork, a division of NSI Industries LLC: [www.tork.com/#sle](http://www.tork.com/#sle).
3. Or approved equal.
4. Substitutions: See Section 01 60 00 - Product Requirements.
5. Source Limitations: Furnish products produced by single manufacturer and obtained from single supplier.

### B. Digital Electronic In-Wall Interval Timers:

1. Description: Factory-assembled solid state programmable controller with LCD display, suitable for mounting in standard wall box, and listed and labeled as complying with UL 916 or UL 917.
2. Program Capability: Designed to turn load off at end of preset time interval.
3. Time Interval: Field selectable range of presets available up to 12 hours.
4. Provide field selectable audible and visual indication to warn that end of interval operation is about to turn off load.
5. Provide power outage backup to retain programming and maintain clock.

6. Manual override: Capable of both turning load off and resetting timer to original preset time interval.
7. Switch Configuration: Suitable for use in either SPST or 3-way application.
8. Contact Ratings: As required to control load indicated on drawings.

C. Spring Wound In-Wall Interval Timers:

1. Description: Factory-assembled controller with mechanical spring wound timing mechanism requiring no electricity to operate; suitable for mounting in standard wall box; rotary control operator with matching wall plate factory marked with time interval units; listed and labeled as complying with UL 916 or UL 917.
2. Program Capability: Designed to turn load off at end of preset time interval.
3. Time Interval: User selectable from zero up to 15 minutes.
4. Manual override: Provide hold feature to disable timer for constant on operation.
5. Switch Configuration: SPST.
6. Contact Ratings: As required to control load indicated on drawings.

2.06 DIGITAL LOAD CONTROLLERS

- A. Manufacturers:
- B. Hubbell Control Solutions: [www.hubbell.com/hubbellcontrolsolutions/en/#sle](http://www.hubbell.com/hubbellcontrolsolutions/en/#sle).
- C. Intermatic, Inc: [www.intermatic.com/#sle](http://www.intermatic.com/#sle).
- D. Lutron Electronics Company, Inc: [www.lutron.com/#sle](http://www.lutron.com/#sle).
- E. Sensor Switch Inc: [www.sensorswitch.com/#sle](http://www.sensorswitch.com/#sle).
- F. WattStopper: [www.wattstopper.com/#sle](http://www.wattstopper.com/#sle).
- G. \_\_\_\_\_.

2.07 ADDITIONAL INTEGRATED REQUIREMENTS FORDIGITAL LOAD CONTROLLERS:

2.08 PRODUCTS:

- A. Intermatic, Inc; ARISTA Lighting Control System: [www.intermatic.com/#sle](http://www.intermatic.com/#sle).
- B. Lutron PowPak Dimming Module; [www.lutron.com/#sle](http://www.lutron.com/#sle).

C. Lutron PowPak Relay Module; [www.lutron.com/#sle](http://www.lutron.com/#sle).

## 2.09 LIGHTING CONTACTORS

### 1. Manufacturers:

- a. ABB; \_\_\_\_\_: [www.electrification.us.abb.com/#sle](http://www.electrification.us.abb.com/#sle).
- b. Eaton Corporation; \_\_\_\_\_: [www.eaton.com/#sle](http://www.eaton.com/#sle).
- c. Rockwell Automation Inc; \_\_\_\_\_: [www.rockwellautomation.com/#sle](http://www.rockwellautomation.com/#sle).
- d. Schneider Electric; \_\_\_\_\_: [www.se.com/#sle](http://www.se.com/#sle).
- e. Siemens Industry, Inc; \_\_\_\_\_: [www.new.siemens.com/#sle](http://www.new.siemens.com/#sle).
- f. Substitutions: See Section 01 60 00 - Product Requirements.

2. Description: Magnetic lighting contactors complying with NEMA ICS 2, and listed and labeled as complying with UL 60947-1 and UL 60947-4-1; noncombination type unless otherwise indicated; ratings, configurations and features as indicated on drawings.

3. Combination Contactors: NEMA ICS 2, Class A combination controllers with magnetic contactors and externally operable disconnect.

- a. Disconnects: Circuit breaker type.
  - 1) Provide externally operable handle with means for locking in the OFF position. Provide safety interlock to prevent opening cover with disconnect in the ON position with capability of overriding interlock for testing purposes.
  - 2) Provide auxiliary interlock for disconnection of external control power sources where applicable.

### 4. Enclosures:

## 2.10 ACCESSORIES

### 1. Auxiliary Contacts:

- a. Comply with NEMA IA 10039.
- b. Provide number and type of contacts indicated or required to perform necessary functions, including holding (seal-in) circuit and interlocking, plus

one normally open (NO) and one normally closed (NC) spare contact for each lighting contactor, minimum.

2. Pilot Devices:

- a. Comply with NEMA IA 10039; heavy-duty type.
- b. Nominal Size: 30 mm.
- c. Pushbuttons: Unless otherwise indicated, provide momentary, non-illuminated type with flush button operator; normally open or normally closed as indicated or as required.
- d. Selector Switches: Unless otherwise indicated, provide maintained, non-illuminated type with knob operator; number of switch positions as indicated or as required.
- e. Indicating Lights: Push-to-test type unless otherwise indicated.
- f. Provide LED lamp source for indicating lights and illuminated devices.

3. Control and Timing Relays:

- a. Comply with NEMA IA 10039.
- b. Provide number and type of relays indicated or required to perform necessary functions.
- c. Timing Relays: Electronic or pneumatic as indicated.
  - 1) Adjustable Timing Range: As indicated on drawings.

4. Fire-Rated Device Enclosures:

- a. Manufacturers:
  - 1) \_\_\_\_\_.
  - 2) Substitutions: See Section 01 60 00 - Product Requirements.
- b. Provide as required to preserve fire resistance rating of building elements.

**PART 3 EXECUTION**

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.

- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.
- F. Verify that service voltage and ratings of lighting control devices are appropriate for service voltage and load requirements at location to be installed.
- G. Verify that conditions are satisfactory for installation prior to starting work.

### 3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

### 3.03 INSTALLATION

- A. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes as required for installation of lighting control devices; see Section 26 05 33.16.
  - 1. Orient outlet boxes for vertical installation of lighting control devices unless otherwise indicated.
  - 2. Locate wall switch occupancy sensors on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect and/or Owner's Representative to obtain direction prior to proceeding with work.
- C. Maintain separation of remote-control, signaling, and power-limited circuits.
  - 1. See manufacturer instructions and Section 26 05 19 for control wiring conductors, wiring methods, and identification requirements.
- D. Install lighting control devices in accordance with manufacturer's instructions.

- E. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- F. Install lighting control devices plumb and level, and held securely in place.
- G. Where required and not furnished with lighting control device, provide wall plate; see Section 26 27 26.
- H. Provide required supports; see Section 26 05 29.
- I. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface 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. Do not use oversized wall plates in lieu of meeting this requirement.
- J. Identify lighting control devices; see Section 26 05 53.
- K. Occupancy Sensor Locations:
  - 1. Location Adjustments: Locations indicated are diagrammatic and only intended to indicate which rooms or areas require devices. Provide quantity and locations as required for complete coverage of respective room or area based on manufacturer's recommendations for installed devices.
  - 2. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors minimum of 6 feet from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.
- L. Daylighting Control Photo Sensor Locations:
  - 1. Location Adjustments: Locations indicated are diagrammatic and only intended to indicate which rooms or areas require devices. Provide quantity and locations as required for proper control of respective room or area based on manufacturer's recommendations for installed devices.
  - 2. Unless otherwise indicated, locate photo sensors for closed loop systems to accurately measure light level controlled at designated task location, while minimizing measured amount of direct light from natural or artificial sources such as windows or pendant luminaires.

3. Unless otherwise indicated, locate photo sensors for open loop systems to accurately measure the level of daylight coming into space, while minimizing measured amount of lighting from artificial sources.

M. Combination Enclosed Lighting Contactors:

1. Except where indicated to be mounted adjacent to equipment they supply, mount lighting contactors such that highest position of operating handle does not exceed 79 inches above floor or working platform.

N. Lamp Burn-In: Operate lamps at full output for minimum of 100 hours or prescribed period per manufacturer's recommendations prior to use with dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.

O. Unless otherwise indicated, install power packs for lighting control devices above accessible ceiling or above access panel in inaccessible ceiling near sensor location.

P. Where indicated, install separate compatible wall switches for manual control interface with lighting control devices or associated power packs.

Q. Unless otherwise indicated, install switches on load side of power packs so that switch does not turn off power pack.

R. Where indicated or required, provide cabinet or enclosure for mounting of lighting control device system components; see Section 26 05 33.16.

3.04 FIELD QUALITY CONTROL

- A. Inspect each lighting control device for damage and defects.
- B. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area. Record test results in written report to be included with submittals.
- C. Test time switches to verify proper operation.
- D. Test daylighting controls to verify proper operation, including light level measurements and time delays where applicable. Record test results in written report to be included with submittals.
- E. Correct wiring deficiencies and replace damaged or defective conductors, cables, and lighting control devices.

3.05 ADJUSTING

- A. Adjust devices and wall plates to be flush and level.
- B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by manufacturer.
- C. Adjust position of directional occupancy sensors and outdoor motion sensors to achieve optimal coverage as required.
- D. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.
- E. Adjust time switch settings to achieve desired operation schedule as indicated or as directed by Owner's Representative.. Record settings in written report to be included with submittals.
- F. Adjust daylighting controls under optimum lighting conditions after all room finishes, furniture, and window treatments have been installed to achieve desired operation as indicated or as directed by Architect. Record settings in written report to be included with submittals. Readjust controls calibrated prior to installation of final room finishes, furniture, and window treatments that do not function properly as determined by Owner's Representative.

### 3.06 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

### 3.07 CLOSEOUT ACTIVITIES

- A. Demonstration: Demonstrate proper operation of lighting control devices to District Representative, and correct deficiencies or make adjustments as directed.
- B. Training: Train Owner's (Owner's) personnel on operation, adjustment, programming, and maintenance of lighting control devices.
  - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
  - 2. Provide minimum of two hours of training.
  - 3. Instructor: Qualified contractor familiar with the project and with sufficient knowledge of installed lighting control devices.

4. Location: At project site.

END OF SECTION

SECTION 26 27 26  
WIRING DEVICES

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Wall switches.
- B. Wall dimmers.
- C. Fan speed controllers.
- D. Receptacles.
- E. Wall plates and covers.
- F. Floor box service fittings.
- G. Access floor boxes.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 00 – Common Work Results for Electrical.
- B. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables:  
Manufactured wiring systems for use with access floor boxes with compatible pre-wired connectors.
- C. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- D. Section 26 05 33.16 - Boxes for Electrical Systems.
- E. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- F. Section 26 05 83 - Wiring Connections: Cords and plugs for equipment.
- G. Section 26 09 23 - Lighting Control Devices: Devices for automatic control of lighting, including occupancy sensors, in-wall time switches, and in-wall interval timers.

1.03 REFERENCE STANDARDS

- A. FS W-C-596 - Connector, Electrical, Power, General Specification for; 2014h (Validated 2022).

- B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush Mounted (General Specification); 2017g (Validated 2023).
- C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- D. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.
- E. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).
- F. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2021.
- G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.
- I. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.
- J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.
- K. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.
- L. UL 1310 - Class 2 Power Units; Current Edition, Including All Revisions.
- M. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.
- N. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.
- O. UL 1917 - Solid-State Fan Speed Controls; Current Edition, Including All Revisions.

#### 1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
  - 2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
  - 3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.

4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
5. Coordinate the core drilling of holes for poke-through assemblies with the work covered under other sections.
6. Notify LP Consulting Engineers, Inc. of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

B. Sequencing:

1. Do not install wiring devices until final surface finishes and painting are complete.

1.05 SUBMITTALS

- A. See Section 01 33 00 for submittal procedures.
- B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.
1. Wall Dimmers: Include derating information for ganged multiple devices.
  2. Surge Protection Receptacles: Include surge current rating, voltage protection rating (VPR) for each protection mode, and diagnostics information.
- C. Samples: One for each type and color of device and wall plate specified.
- D. Certificates for Surge Protection Receptacles: Manufacturer's documentation of listing for compliance with UL 1449.
- E. Field Quality Control Test Reports.
- F. 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.
- G. Operation and Maintenance Data:
1. Wall Dimmers: Include information on operation and setting of presets.
  2. GFCI Receptacles: Include information on status indicators.
  3. Surge Protection Receptacles: Include information on status indicators.
- H. Project Record Documents: Record actual installed locations of wiring devices.

I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 60 00 - Product Requirements, for additional provisions.
2. Screwdrivers for Tamper-Resistant Screws: Two for each type of screw.
3. Extra Keys for Locking Switches: Two of each type.
4. Extra Surge Protection Receptacles: Two of each type.
5. Extra Wall Plates: One of each style, size, and finish.
6. Extra Flush Floor Service Fittings: Two of each type.
7. Extra Poke-Through Core Hole Closure Plugs: Two for each core size.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- D. Products: Listed, classified, and labeled as suitable for the purpose intended.
- E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.
- B. Products: Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

**PART 2 PRODUCTS**

2.01 WIRING DEVICES - GENERAL REQUIREMENTS

2.02 MANUFACTURERS

- A. Cooper Wiring Devices: [www.cooperwiringdevices.com](http://www.cooperwiringdevices.com).
- B. GE Industrial: [www.geindustrial.com](http://www.geindustrial.com).
- C. Leviton Manufacturing, Inc: [www.leviton.com](http://www.leviton.com).
- D. Pass & Seymore.
- E. Hubbell.
- F. Bryant.
- G. Arrow-Hart.
- H. Or approved equal.

#### 2.03 WIRING DEVICE APPLICATIONS

- A. Provide wiring devices suitable for intended use and with ratings adequate for load served.
- B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.
- C. Provide tamper resistant receptacles for receptacles installed in dwelling units.
- D. Provide GFCI protection for receptacles installed within 6 feet of sinks.
- E. Provide isolated ground receptacles for receptacles serving computers and electronic cash registers.
- F. Unless noted otherwise, do not use combination switch/receptacle devices.
- G. For flush floor service fittings, use tile rings for installations in tile floors.
- H. For flush floor service fittings, use carpet flanges for installations in carpeted floors.

#### 2.04 WIRING DEVICE FINISHES

- A. Provide wiring device finishes as described below unless otherwise indicated.
- B. Wiring Devices, Unless Otherwise Indicated: White with white nylon wall plate.
- C. Wiring Devices Installed in Finished Spaces: White with white nylon wall plate.
- D. Wiring Devices Installed in Unfinished Spaces: Gray with galvanized steel wall plate.

- E. Wiring Devices Installed in Wet or Damp Locations: White with specified weatherproof cover.
- F. Surge Protection Receptacles: Blue.
- G. Wiring Devices Connected to Emergency Power: Red with red nylon wall plate.
- H. Clock Hanger Receptacles: Brown with stainless steel wall plate.
- I. Access Floor Boxes: Gray wiring devices with gray steel cover with insert to match floor covering.

## 2.05 ALL WIRING DEVICES

- A. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

## 2.06 WALL SWITCHES

- A. Wall Switches - General Requirements: 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 and where applicable FS W-S-896; types as indicated on the drawings.
  - 1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.
- B. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.
  - 1. Products:
    - a. Single-pole: Hubbell #1221-I, Bryant #4901-GI, Pass & Seymour #20AC1-I.
    - b. Double-pole: Hubbell #1222-I, Brant #4902-GI, Pass & Seymour #20AC2-I.
    - c. Three-way: Hubbell #1223-I, Bryant #4903-GI, Pass & Seymour #20AC3-I.
    - d. Four-way: Hubbell #1224-I, Bryant #4904-GI, Pass & Seymour #20AC4-I.
    - e. Substitutions: See Section 01 60 00 - Product Requirements.
- C. Lighted Wall Switches: Industrial specification grade, 20 A, 120/277 V with illuminated standard toggle type switch actuator and maintained contacts;

illuminated with load off; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

- D. Pilot Light Wall Switches: Industrial specification grade, 20 A, 120/277 V with red illuminated standard toggle type switch actuator and maintained contacts; illuminated with load on; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.
  - 1. Products:
    - a. Hubbell #1221-PLR, Bryant #4901-PLR, Pass & Seymour #20AC1-PLR.
    - b. Or approved equal.
    - c. Substitutions: See Section 01 60 00 - Product Requirements.
- E. Locking Wall Switches: Industrial specification grade, 20 A, 120/277 V with barrel type keyed switch actuator and maintained contacts; switches keyed alike; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.
- F. Momentary Contact Wall Switches: Industrial specification grade, 20 A, 120/277 V with toggle type three position switch actuator and momentary contacts; single pole double throw, off with switch actuator in center position.
- G. Locking Momentary Contact Wall Switches: Industrial specification grade, 20 A, 120/277 V with lever type keyed three position switch actuator and momentary contacts; switches keyed alike; single pole double throw, off with switch actuator in center position.
- H. Wall Switches: Heavy Duty, AC only general-use snap switch, complying with NEMA WD 6 and WD 1.
  - 1. Body and Handle: white plastic with toggle handle.
  - 2. Indicator Light: Lighted handle type switch; red handle.
  - 3. Locator Light: Lighted handle type switch; red color handle.
  - 4. Ratings:
    - a. Voltage: 120 and 277 volts, AC.
    - b. Current: 20 amperes.
- I. Switch Types: Single pole, double pole, and 3-way.

## 2.07 WALL DIMMERS

### A. Manufacturers:

1. Leviton Manufacturing Company, Inc: [www.leviton.com/#sle](http://www.leviton.com/#sle).
2. Lutron Electronics Company, Inc; Maestro Series: [www.lutron.com/#sle](http://www.lutron.com/#sle).
3. Pass & Seymour, a brand of Legrand North America, Inc: [www.legrand.us/#sle](http://www.legrand.us/#sle).
4. Or approved equal.
5. Substitutions: See Section 01 60 00 - Product Requirements.

### B. Wall Dimmers - General Requirements: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1472; types and ratings suitable for load controlled as indicated on the drawings.

### C. Control: Slide control type with separate on/off switch.

### D. Power Rating, Unless Otherwise Indicated or Required to Control the Load Indicated on the Drawings:

1. Magnetic Low-Voltage: 600 VA.
2. Electronic Low-Voltage: 400 VA.
3. LED: 600 VA

### E. Provide locator light, illuminated with load off.

### F. Provide accessory wall switches to match dimmer appearance when installed adjacent to each other.

### G. LED Wall Dimmers: NEMA WD 1, Type II semiconductor dimmer for LED lamps.

1. Power rating to match load shown on the drawings.
2. Voltage as required for controlled LED fixtures.

### H. Provide accessory wall switches to match dimmer appearance when installed adjacent to each other.

## 2.08 FAN SPEED CONTROLLERS

- A. Description: 120 V AC, solid-state, full-range variable speed, slide control type with separate on/off switch, with integral radio frequency interference filtering, fan noise elimination circuitry, power failure preset memory, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1917.

- 1. Current Rating: 1.5 A unless otherwise indicated or required to control the load indicated on the drawings.

## 2.09 RECEPTACLES

- A. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498 and where applicable FS W-C-596; types as indicated on the drawings.

- 1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
  - 2. NEMA configurations specified are according to NEMA WD 6.
  - 3. Hospital Grade Receptacles: Listed as complying with UL 498 Supplement SD, with green dot hospital grade mark on device face.

- B. Convenience Receptacles:

- 1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
  - 2. Automatically Controlled Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; controlled receptacle marking on device face per NFPA 70; single or duplex as indicated on the drawings.
  - 3. Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.
  - 4. Tamper Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; single or duplex as indicated on the drawings.
  - 5. Tamper Resistant and Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement

SD suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.

6. Illuminated Convenience Receptacles: Hospital grade, 20A, 125V, NEMA 5-20R; illuminated face or indicator light to indicate power is being supplied to receptacle; single or duplex as indicated on the drawings.

C. GFCI Receptacles:

1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
  - a. Provide test and reset buttons of same color as device.
2. Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
3. Weather Resistant GFCI 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 SD suitable for installation in damp or wet locations.
4. Tamper Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type.
5. Tamper Resistant and Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations.

D. USB Charging Devices:

1. USB Charging Devices - General Requirements: Listed as complying with UL 1310.
  - a. Charging Capacity - Two-Port Devices: 2.1 A, minimum.
  - b. Charging Capacity - Four-Port Devices: 4.2 A, minimum.
2. USB Charging/Tamper Resistant Receptacle Combination Devices: Two-port (Type C) USB charging device and receptacle, commercial specification grade,

duplex, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; rectangular decorator style.

3. USB Charging Noncombination Devices: Four-port (Type C); rectangular decorator style.

E. Surge Protection Receptacles:

1. Surge Protection Receptacles - General Requirements: Listed and labeled as complying with UL 1449, Type 2 or 3.

- a. Energy Dissipation: Not less than 240 J per mode.
- b. Protected Modes: L-N, L-G, N-G.
- c. UL 1449 Voltage Protection Rating (VPR): Not more than 700 V for L-N, L-G modes and 1200 V for N-G mode.

- d. Diagnostics:

- 1) Visual Notification: Provide indicator light to report functional status of surge protection.
- 2) Audible Notification: Provide switchable audible alarm to report that surge protection is not functional.

2. Standard Surge Protection Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.

F. Locking Receptacles: Industrial specification grade, configuration as indicated on the drawings.

1. Standard Locking Convenience Receptacles: Single, 20A, 125V, NEMA L5-20R.

G. Clock Hanger Receptacles: Single, 15A, 125V, NEMA 5-15R.

H. Special Purpose Receptacle Outlet: .20A, 250V, 3 pole, 4 wire, 3 phase grounding, single: NEMA 15-20R; black (Hubbell 8420).

I. Special Purpose Receptacle Outlet: 20A, 125/250V, 3 pole, 4 wire, 1 phase grounding, single: NEMA 14-20R; black (Hubbell 8410).

J. Special Purpose Receptacle Outlet: 30A, 125V, 2 pole, 3 wire grounding, single; NEMA 5-30R; black (Hubbell 9308).

- K. Special Purpose Receptacle Outlet: 30A, 250V, 2 pole, 3 wire grounding, single; NEMA 6-30R; black (Hubbell 9330).
- L. Special Purpose Receptacle Outlet: 30A, 250V, 3 pole, 4 wire, 3 hose, grounding, single; NEMA 15-30R; black (Hubbell 8430A).
- M. Special Purpose Receptacle Outlet: 30A, 125/250V, 3 pole, 4 wire, 1 phase grounding, single; NEMA 14-30 R; black (Hubbell 9430A).
- N. Special Purpose Receptacle Outlet: 30A, 250V, 2 pole, 3 wire, 1 phase grounding, single, twist-lock; NEMA L6-30R; black (Hubbell 2620).
- O. Special Purpose Receptacle Outlet: 30A, 250V, 3 pole, 4 wire, 3 phase, grounding, single, twist-lock; NEMA L15-30R; black (Hubbell 2720).
- P. Special Purpose Receptacle Outlet: 50A, 250V, 2 pole, 3 wire, 1 phase, grounding, single; NEMA 6-50R; black (Hubbell 9367).
- Q. Special Purpose Receptacle Outlet: 50A, 250V, 2 pole, 3 wire, 1 phase, grounding, single, twist-lock; black (Hubbell 25505), with wall plate per NFPA 56A. Portable x-ray receptacle.
- R. Special Purpose Receptacle Outlet: 20A, 250V, 2 pole, 3 wire, 1 phase, grounding, single, twist-lock; NEMA L6-20R; black (Hubbell 2320).
- S. Special Purpose Receptacle Outlet: 50A, 125/250V, 3 pole, 4 wire, 1 phase, grounding, single; NEMA 14-50R; black (Hubbell 9450A).
- T. Special Receptacle: 20A, 4 pole, 5 wire, 3 phase Y, 120/208V; NEMA L21-20; black (Hubbell 2510).
- U. Special Receptacle: 30A, 4 pole, 5 wire, 3 phase Y, 120/208V; NEMA L21-30; black (Hubbell 2810).
- V. Special Purpose Receptacle Outlet: 15A, 125V, 2 pole, 3 wire, isolated ground, duplex; NEMA 5-15R; orange (Hubbell IG-5262).
- W. Special Purpose Receptacle Outlet: 20A, 125V, 2 pole, 3 wire, isolated ground, duplex; NEMA 5029R; orange (Hubbell IG-5362).
- X. Special Purpose Receptacle Outlet: 30A, 125V, 2 pole, 3 wire, 1 phase, grounding, single, twist-lock; NEMA L5-30R; black (Hubbell 2610).
- Y. Special Purpose Receptacle Outlet: 20A, 125V, 2 pole, 3 wire, single, twist-lock; NEMA L5-20R; black.

Z. Special Receptacle Outlet: 30A, 250V, 2 pole, 3 wire, 1 phase grounding, single, twist lock, isolated ground; NEMA L6-30R; orange (Hubbell IG-2620).

AA. Special Receptacle Outlet: 30A, 4 pole, 5 wire, 3 phase Y, 277/408V; NEMA L22-30, black.

BB. Special Receptacle Outlet: 60A, 3 pole, 4 wire, 3 phase, 480V; watertight pin and sleeve type; red, Hubbell 460R7W with BB601W 15 degree angle back box.

CC. Special Receptacle Outlet: 60A, 277/480V, 4 pole, 5 wire, single pin and sleeve.

1. Manufacturers

- a. Appleton.
- b. Hubbell; Model 560R7W.
- c. Or approved equal.

DD. Special Receptacle Outlet: 60A, 250V, 3 pole, 4 wire, 3 phase, grounding, single; NEMA 15-60R; black.

1. Manufacturers

- a. Bryant; Model 8460.
- b. Hubbell; Model 8460A.
- c. Pass & Seymour; Model 5760-BL.
- d. Or approved equal.

EE. Other receptacle types as indicated on the drawings and/or as required for connection of designated equipment.

## 2.10 WALL PLATES AND COVERS

A. Wall Plates: Comply with UL 514D.

- 1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
- 2. Size: Standard.
- 3. Screws: Metal with slotted heads finished to match wall plate finish.

4. Provide screwless wallplates with concealed mounting hardware where indicated.
- B. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.
- C. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.
- D. Brass Wall Plates: Brushed satin finish, factory-coated to inhibit oxidation.
- E. Aluminum Wall Plates: Smooth satin finish, clear anodized, factory-coated to inhibit oxidation.
- F. Chrome Wall Plates: Smooth finish, chrome plated steel.
- G. Galvanized Steel Wall Plates: Rounded corners and edges, with corrosion resistant screws.
- H. Pre-marked Wall Plates: Factory labeled as indicated; hot stamped for nylon wall plates and engraved for metal wall plates.
- I. Weatherproof Covers for Damp Locations: Gasketed, cast aluminum, with self-closing hinged cover and corrosion-resistant screws; listed as suitable for use in wet locations with cover closed.
- J. 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 and identified as extra-duty type.
- K. Weatherproof Switch Covers for Wet or Damp Locations: Gasketed, metallic, with externally operable actuating means and corrosion-resistant screws; listed as suitable for use in wet locations.
- L. Decorative Cover Plates: white, nylon, verify color with architect .
- M. Jumbo Cover Plates: white, nylon, verify color with architect.
- N. Weatherproof Cover Plates: Gasketed cast metal with hinged.
- O. Inmate Areas: In Correctional Facilities
  1. Minimum Level Device Plate: Type 430 stainless steel, flush, satin finish, approximately 20 gauge.
    - a. Hollow Metal Jamb Posts: Arrow-Hart #T-1650; Bryant, Stainless Steel.

2. Medium Level Device Plate: Stainless steel; Type 430.
3. Maximum Level Device Plate:
  - a. Back Plate: Cold rolled steel; 10 gauge, prime painted.
  - b. Cover Plate: Steel; 10 gauge, prime painted.
  - c. Fasteners: Minimum for security fasteners.
  - d. Manufacturers: Hubbell, Fail-Safe, Mark.
  - e. Cast Metal Plate for Surface Type Boxes: Corrosive resistant, cast ferrous metal, designed for the application.
  - f. Plastic Device Plates: Not permitted.
  - g. Device Plates Installed in Housing Units: Patient Cells, Holding Cells, and Receiving Tanks shall be maximum level device plates.
  - h. Device Plates Installed In Mechanical Rooms, Electrical Rooms, Control Rooms and areas 12 feet or more above finished floor shall be minimum level device plates.
  - i. Device plates installed in other areas shall be Medium level device plates.

#### 2.11 FLOOR BOX SERVICE FITTINGS

- A. Description: Service fittings compatible with floor boxes provided under Section 26 05 33.16 with components, adapters, and trims required for complete installation.
- B. Above-Floor Service Fittings:
  1. Single Service Pedestal Convenience Receptacles:
    - a. Configuration: One standard convenience duplex receptacle.
  2. Single Service Pedestal Communications Outlets:
    - a. Configuration: One 1 inch bushed opening.
  3. Single Service Pedestal Furniture Feed:
    - a. Configuration: One 3/4 inch knockout.
  4. Dual Service Pedestal Combination Outlets:

- a. Configuration:
    - 1) Power: One standard convenience duplex receptacle.
    - 2) Communications: One 1 inch bushed opening.
  - b. Provide barrier to separate line and low voltage compartments.
- C. Flush Floor Service Fittings:
- 1. Single Service Flush Convenience Receptacles:
    - a. Cover: Rectangular.
    - b. Configuration: One standard convenience duplex receptacle(s) with duplex flap opening(s).
  - 2. Single Service Flush Furniture Feed:
    - a. Cover: Rectangular.
    - b. Configuration: One 2-1/8 inch by 3/4 inch combination threaded opening(s).
  - 3. Dual Service Flush Combination Outlets:
    - a. Cover: Rectangular.
    - b. Configuration:
      - 1) Power: One standard convenience duplex receptacle(s) with duplex flap opening(s).
  - 4. Dual Service Flush Furniture Feed:
    - a. Cover: Rectangular.
    - b. Configuration:
      - 1) Power: One 2-1/8 inch by 3/4 inch combination threaded opening(s).
      - 2) Communications: One 2-1/8 inch by 1 inch combination threaded opening(s).
  - 5. Accessories:

- a. Tile Rings: Finish to match covers; configuration as required to accommodate specified covers.
- b. Carpet Flanges: Finish to match covers; configuration as required to accommodate specified covers.

## 2.12 ACCESS FLOOR BOXES

### A. Manufacturers - Access Floor Boxes with Pre-wired Connectors for Manufactured Wiring Systems:

- 1. AFC Cable Systems Inc: [www.afcweb.com/#sle](http://www.afcweb.com/#sle).
- 2. RELOC Wiring Solutions, a brand of Acuity Brands, Inc: [www.relocwiring.com/#sle](http://www.relocwiring.com/#sle).
- 3. Wiremold, a brand of Legrand North America, Inc: [www.legrand.us/#sle](http://www.legrand.us/#sle).
- 4. Or approved equal.
- 5. Substitutions: See Section 01 60 00 - Product Requirements.
- 6. Source Limitations: Provide access floor boxes with pre-wired connectors produced by the same manufacturer as the manufactured wiring system used for this project.

### B. Access floor boxes with pre-wired connectors for manufactured wiring systems are permitted only where manufactured wiring systems are permitted as specified in Section 26 05 19.

### C. Configuration:

- 1. Power: Two standard convenience duplex receptacle(s) unless noted otherwise on drawings.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

- C. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that floor boxes are adjusted properly.
- F. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- G. Verify that core drilled holes for poke-through assemblies are in proper locations.
- H. Verify that openings in access floor are in proper locations.
- I. Verify that conditions are satisfactory for installation prior to starting work.

### 3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

### 3.03 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, except for mounting heights specified in those standards.
- B. Perform work in a neat and workmanlike manner in accordance with NECA 1, except for mounting heights specified in that standard.
- C. Coordinate locations of outlet boxes provided under Section 26 05 33.16 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 to top of box CEC 1117B.6(5).
    - b. Wall Dimmers: 48 inches above finished floor to top of box CEC 1117B.6(5).
    - c. Fan Speed Controllers: 48 inches above finished floor to top of box CEC 1117B.6(5).
    - d. Receptacles: 18 inches above finished floor or 6 inches above counter.
    - e.

2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
  3. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
  4. Locate wall switches on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Owner to obtain direction prior to proceeding with work.
  5. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.
- D. Install wiring devices in accordance with manufacturer's instructions.
- E. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- F. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.
- G. 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.
- H. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- I. For isolated ground receptacles, connect wiring device grounding terminal only to identified branch circuit isolated equipment grounding conductor. Do not connect grounding terminal to outlet box or normal branch circuit equipment grounding conductor.
- J. Provide GFCI receptacles with integral GFCI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.
- K. Where split-wired duplex receptacles are indicated, remove tabs connecting top and bottom receptacles.
- L. Install securely, in a neat and workmanlike manner, as specified in NECA 1.
- M. Install wiring devices plumb and level with mounting yoke held rigidly in place.

- N. Install wall switches with OFF position down.
- O. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.
- P. Do not share neutral conductor on branch circuits.
- Q. Install vertically mounted receptacles with grounding pole on bottom and horizontally mounted receptacles with grounding pole on right.
- R. 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. Do not use oversized wall plates in lieu of meeting this requirement.
- S. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.
- T. Identify wiring devices in accordance with Section 26 05 53.
- U. Install identification label for wall switches and wall dimmers in accordance with Section 26 05 26 indicating load served when controlling loads that are not visible from the control location or multiple wall switches or wall dimmers are installed at one location.
- V. Install identification label for all receptacles in accordance with Section 26 05 26 indicating serving branch circuit.
- W. Install poke-through closure plugs in each unused core holes to maintain fire rating of floor.
- X. Install receptacles with grounding pole on bottom.
- Y. Connect wiring device grounding terminal to outlet box with bonding jumper.
- Z. Install decorative plates on switch, receptacle, and blank outlets in finished areas.
- AA. Connect wiring devices by wrapping conductor around screw terminal.
- BB. Use jumbo size plates for outlets installed in masonry walls.
- CC. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.
- DD. Install protective rings on active flush cover service fittings.

### 3.04 CONSTRUCTION

#### A. Interface with Other Work

1. Coordinate locations of outlet boxes to obtain mounting heights specified unless otherwise indicated on drawings. All dimensions are to the center of the item.
2. Install convenience receptacle four inches above backsplash of counters or four inches above counter if no backsplash. Mount horizontal where indicated
3. Install electric water cooler outlet boxes centered behind unit, behind electric water cooler cover. Coordinate with equipment installer.

- #### B. Locate wall switches on the strike side of door with edge of wall plate three inches from edge of door frame. Where locations are indicated otherwise, notify the Electrical Engineer of Record to obtain direction prior to proceeding with work.

### 3.05 FIELD QUALITY CONTROL

#### A. Site Test

1. Operate each wall switch, wall dimmer and fan speed control with circuit energized and verify proper operation.
2. Test each receptacle to verify operation and proper polarity.
3. Verify that each receptacle is energized.
4. Test each GFCI receptacle for proper tripping operation and proper polarity.
5. Inspect each surge protection receptacle to verify surge protection is active.

- #### B. Inspect each wiring device for damage and defects.

- #### C. Correct wiring deficiencies and replace damaged or defective wiring devices.

### 3.06 ADJUSTING

- #### A. Adjust devices and wall plates to be flush and level.

- #### B. Adjust presets for wall dimmers according to manufacturer's instructions as directed by Owner's Representative.

### 3.07 CLEANING

- #### A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION

SECTION 26 51 00  
INTERIOR LIGHTING

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Interior luminaires.
- B. Exit signs.
- C. Ballasts and drivers.

1.02 RELATED REQUIREMENTS

- A. Section 26 05 00 – Common Work Results for Electrical.
- B. Section 26 05 29 - Hangers and Supports for Electrical Systems.
- C. Section 26 05 33.16 - Boxes for Electrical Systems.
- D. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.
- E. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.
- F. Section 26 09 23 - Lighting Control Devices.
  - 1. Includes automatic controls for lighting including occupancy sensors, outdoor motion sensors, time switches, outdoor photo controls, and daylighting controls.
  - 2. Includes lighting contactors.
- G. Section 26 27 26 - Wiring Devices: Manual wall switches and wall dimmers.

1.03 REFERENCE STANDARDS

- A. 47 CFR 15 - Radio Frequency Devices; current edition.
- B. IEC 60529 - Degrees of Protection Provided by Enclosures (IP Code); 1989 (Corrigendum 2019).
- C. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Corrigendum 2012).

- D. IES LM-63 - Approved Method: IES Standard File Format for the Electronic Transfer of Photometric Data and Related Information; 2019.
- E. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2024.
- F. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources; 2021.
- G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2023.
- H. NECA/IESNA 500 - Standard for Installing Indoor Lighting Systems; 2006.
- I. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.
- J. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2023.
- K. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2023.
- L. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- M. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- N. UL 844 - Luminaires for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.
- O. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.
- P. UL 1598 - Luminaires; Current Edition, Including All Revisions.
- Q. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

#### 1.04 ADMINISTRATIVE REQUIREMENTS

##### A. Coordination:

1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.

2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.
4. Notify LP Consulting Engineers, Inc. of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

#### 1.05 SUBMITTALS

- A. See Section 01 33 00 for submittal procedures.
- B. Shop Drawings:
  1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
  2. Provide photometric calculations where luminaires are proposed for substitution.
- C. 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. LED Luminaires:
    - a. Include estimated useful life, calculated based on IES LM-80 test data.
    - b. Include IES LM-79 test report upon request.
  2. Provide electronic files of photometric data certified by a National Voluntary Laboratory Accreditation Program (NVLAP) lab or independent testing agency in IES LM-63 standard format upon request.
- D. Samples:
  1. Provide one sample(s) of each specified luminaire where indicated.
  2. Provide one sample(s) of each custom luminaire.

3. Provide one sample(s) of each luminaire proposed for substitution upon request.
  4. Provide one sample(s) of each product finish illustrating color and texture upon request.
- E. Field quality control reports.
- F. 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.
- G. Operation and Maintenance Data: Instructions for each product including information on replacement parts.
- H. Maintenance Materials: Furnish the following for Owner's (Owner's) use in maintenance of project.
1. See Section 01 60 00 - Product Requirements, for additional provisions.
  2. Extra Lenses and Louvers: Two percent of total quantity installed for each type, but not less than one of each type.
  3. Extra LED Drivers: Two percent of total quantity installed for each type, but not less than one of each type.
- I. Project Record Documents: Record actual connections and locations of luminaires and any associated remote components.

#### 1.06 QUALITY ASSURANCE

- A. Conform to requirements of California Electrical Code.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.
- D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

#### 1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting) and manufacturer's written instructions.
- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.08 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

- A. Provide 3-year manufacturer warranty for LED luminaires, including drivers.
- B. Provide 10-year pro-rata warranty for batteries for self-powered exit signs.
- C. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

**PART 2 PRODUCTS**

2.01 MANUFACTURERS - LUMINAIRES

- A. Furnish products as indicated in Lighting Fixture Schedule included on the Drawings
  - 1. General: Lighting fixtures as hereinafter specified are identified by type as noted on drawings. Fixture specifications are based on construction and performance. Manufacturer's catalog numbers are of general nature and indicate the level of quality required, but do not necessarily reflect complete options and accessories required. Approval shall be based on description and specification of fixture as well as catalog number indicated. Verify fixture voltage requirements with circuitry shown on drawings and provide appropriate equipment.

2.02 LUMINAIRE TYPES

- A. Furnish products as indicated in luminaire schedule included on the drawings.
- B. Substitutions: See Section 01 60 00 - Product Requirements.

2.03 LUMINAIRES

- A. Manufacturers:
  - 1. Acuity Brands, Inc: [www.acuitybrands.com/#sle](http://www.acuitybrands.com/#sle).
  - 2. Alloy LED; [www.alloyled.com/#sle](http://www.alloyled.com/#sle).

3. Cooper Lighting, a division of Cooper Industries:  
[www.cooperindustries.com/#sle](http://www.cooperindustries.com/#sle).
  4. Electro-Matic Visual, Inc; [www.empvisual.com/#sle](http://www.empvisual.com/#sle).
  5. Hubbell Lighting, Inc: [www.hubbelllighting.com/#sle](http://www.hubbelllighting.com/#sle).
  6. Philips Lighting North America Corporation;  
[www.lightingproducts.philips.com/#sle](http://www.lightingproducts.philips.com/#sle).
  7. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Provide products that comply with requirements of NFPA 70.
- C. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- D. Provide products listed, classified, and labeled as suitable for the purpose intended.
- E. Provide products complying with Federal Energy Management Program (FEMP) requirements.
- F. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, drivers, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- G. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.
- H. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- I. Recessed Luminaires:
1. Ceiling Compatibility: Comply with NEMA LE 4.
  2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.
  3. Luminaires Recessed in Sloped Ceilings: Provide suitable sloped ceiling adapters.
- J. LED Luminaires:
1. Components: UL 8750 recognized or listed as applicable.

2. Tested in accordance with IES LM-79 and IES LM-80.
  3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.
- K. LED Tape Lighting Systems: Provide all power supplies, drivers, cables, connectors, channels, covers, mounting accessories, and interfaces as necessary to complete installation.
1. LED Tape - General Requirements:
    - a. Listed.
    - b. Designed for field cutting in accordance with listing.
    - c. Wet Location Applications: IEC 60529, IP 68 (waterproof) rated.
  2. White LED Tape:
    - a. Correlated Color Temperature (CCT): 3500 K unless otherwise indicated.
    - b. Color Rendering Index (CRI): Not less than 90.
- L. Track Lighting Systems: Provide track compatible with specified track heads, with all connectors, power feed fittings, dead ends, hangers and canopies as necessary to complete installation.
- M. Luminaires Mounted in Continuous Rows: Provide quantity of units required for length indicated, with all accessories required for joining and aligning.

## 2.04 EXIT SIGNS

- A. Description: Exit signs and similar signs for special purpose applications such as area of refuge/rescue assistance.
- B. Description: Exit signs complying with NFPA 101 and applicable state and local codes, and listed and labeled as complying with UL 924.
1. Number of Faces: Single- or double-face as indicated or as required for installed location.
  2. Directional Arrows: As indicated or as required for installed location.
- C. Powered Exit Signs: Internally illuminated with LEDs unless otherwise indicated.
1. Manufacturers:

- a. Acuity Brands, Inc: [www.acuitybrands.com/#sle](http://www.acuitybrands.com/#sle).
- b. Cooper Lighting, a division of Cooper Industries;;  
[www.cooperindustries.com/#sle](http://www.cooperindustries.com/#sle).
- c. Hubbell Lighting, Inc: [www.hubbelllighting.com/#sle](http://www.hubbelllighting.com/#sle).
- d. Philips Lighting North America Corporation;  
[www.lightingproducts.philips.com/#sle](http://www.lightingproducts.philips.com/#sle).
- e. Or approved equal.
- f. Substitutions: See Section 01 60 00 - Product Requirements.

D. Accessories:

- 1. Provide compatible accessory high-impact polycarbonate vandal shields where indicated.
- 2. Provide compatible accessory wire guards where indicated.

E. Manufacturers: Furnish products as indicated in Lighting Fixture Schedule included on the Drawings

F. Exit Signs: Exit sign fixture suitable for use as emergency lighting unit.

- 1. Provide fixtures complying with NFPA 101.
- 2. Lamps: LED.
- 3. Directional Arrows: Universal type for field adjustment.
- 4. Mounting: Universal, for field selection.
- 5. Battery: 6 or 12 volt, nickel-cadmium type, with 1.5 hour capacity.
- 6. Battery Charger: Dual-rate type, with sufficient capacity to recharge discharged battery to full charge within twelve hours.
- 7. Lamps: Manufacturer's standard.

2.05 BALLASTS AND DRIVERS

A. Manufacturers:

- 1. Alloy LED; [www.alloyled.com/#sle](http://www.alloyled.com/#sle).
- 2. General Electric Company/GE Lighting: [www.gelighting.com/#sle](http://www.gelighting.com/#sle).

3. Lutron Electronics Company, Inc: [www.lutron.com/#sle](http://www.lutron.com/#sle).
4. OSRAM Sylvania, Inc: [www.osram.us/ds/#sle](http://www.osram.us/ds/#sle).
5. Philips Lighting North America Corporation; [www.usa.lighting.philips.com/#sle](http://www.usa.lighting.philips.com/#sle).
6. Substitutions: See Section 01 60 00 - Product Requirements.
7. Where a specific manufacturer or model is indicated elsewhere in the luminaire schedule or on the drawings, substitutions are not permitted unless explicitly indicated.

B. Ballasts/Drivers - General Requirements:

1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.
3. Electronic Ballasts/Drivers: Inrush currents not exceeding peak currents specified in NEMA 410.

C. LED Drivers:

1. Luminaires shall be equipped with an LED driver(s) that accepts the voltage as indicated on the Fixture Schedule on the drawings. Individual driver(s) shall be replaceable
2. Driver(s) shall be UL8750 class 2 compliant for their intended use.
3. Total harmonic distortion (THD) for current:  $\leq 20\%$ .
4. Driver(s) shall be rated to operate between -30 degrees C to 50 degrees C minimum.
5. Individual drivers shall be equipped with surge protection (6kV minimum) in accordance with IEEE/ANSI C62.4.1. Driver(s) shall be protected against damage due to either an open circuit or short circuit fault condition on the driver output.
6. Driver(s) shall have a minimum efficiency of 85 percent.
7. LED driver(s) shall have a minimum lifetime of 50,000+ hours at 40 degrees C and shall have a minimum efficiency of 80 lumens per watt.
8. LED dies shall be tested in accordance with I.E.S.N.A. LM-80-08 standards.

9. Thermal management shall be passive by design and shall consist of heat sinks with no fans, pumps, or liquids.
10. Dimming Range: Continuous dimming from 100 percent to ten percent relative light output unless dimming capability to lower level is indicated, without flicker.
11. Control Compatibility: Fully compatible with the dimming controls to be installed.
  - a. Wall Dimmers: See Section 26 27 26.
  - b. Daylighting Controls: See Section 26 09 23.
12. Product(s):
  - a. Lutron Hi-Lume Premier 0.1% Constant Voltage (L3D0-Series): 3-wire and digital control; 0.1 percent dimming with Soft-On and Fade-to-Black low end performance; [www.lutron.com/#sle](http://www.lutron.com/#sle).
  - b. Lutron Hi-Lume 1% (L3D-Series): 3-wire and digital control; one percent dimming; [www.lutron.com/#sle](http://www.lutron.com/#sle).
  - c. Lutron Hi-Lume 1% Soft-on Fade-to-Black (LDE1-Series): Digital control; one percent dimming with Soft-On and Fade-to-Black low end performance; [www.lutron.com/#sle](http://www.lutron.com/#sle).

## 2.06 ACCESSORIES

- A. Stems for Suspended Luminaires: Steel tubing, minimum 1/2" size, factory finished to match luminaire or field-painted as directed.
- B. Threaded Rods for Suspended Luminaires: Zinc-plated steel, minimum 1/4" size, field-painted as directed.
- C. Provide accessory plaster frames for luminaires recessed in plaster ceilings.
- D. Provide wire guards for lighting fixtures and equipment where indicated on the drawings.

## 2.07 SPARE PARTS

- A. The Contractor shall furnish to the Owner at the completion of the project, a minimum of 5 percent spare LED driver assemblies and light engines for each LED fixture type. LED drivers shall be turned over to the Owner's Representative in their

manufacturer's protective packaging. LED drivers not in their protective packaging will not be acceptable.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
- C. Verify that suitable support frames are installed where required.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- E. Verify that conditions are satisfactory for installation prior to starting work.

#### **3.02 PREPARATION**

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

#### **3.03 INSTALLATION**

- A. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of luminaires provided under this section.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install products in accordance with manufacturer's instructions.
- D. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).
- E. Provide required support and attachment in accordance with Section 26 05 29.
- F. Provide required seismic controls in accordance with Section 26 05 48.
- G. Provide seismic sway bracing restraints when an installed suspended luminaire's distance from the nearest permanent object (structural, mechanical, etc.) is less than 0.707 of the total suspension cable (stem) length.

- H. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- I. Suspended Ceiling Mounted Luminaires:
  - 1. Do not use ceiling tiles to bear weight of luminaires.
  - 2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
  - 3. Secure surface-mounted and recessed luminaires to ceiling support channels or framing members or to building structure.
  - 4. Secure pendant-mounted luminaires to building structure.
  - 5. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
  - 6. In addition to ceiling support wires, provide two galvanized steel safety wire(s), minimum 12 gauge, connected from opposing corners of each recessed luminaire to building structure.
  - 7. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.
- J. Recessed Luminaires:
  - 1. Install trims tight to mounting surface with no visible light leakage.
  - 2. Non-IC Rated Luminaires: Maintain required separation from insulation and combustible materials according to listing.
  - 3. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.
  - 4. Install recessed luminaires to permit removal from below.
  - 5. Install clips to secure recessed grid supported luminaires in place. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
  - 6. In addition to ceiling support wires, provide two galvanized steel safety wire(s), minimum 12 gauge, connected from opposing corners of each recessed luminaire to building structure.
- K. Suspended Luminaires:

1. Unless otherwise indicated, specified mounting heights are to bottom of luminaire.
  2. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.
  3. Provide minimum of two supports for each luminaire equal to or exceeding 4 feet nominal length, with no more than 4 feet between supports.
  4. Install canopies tight to mounting surface.
  5. Unless otherwise indicated, support pendants from swivel hangers.
  6. Provide seismic sway bracing where indicated or as required by the application.
- L. Wall-Mounted luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.
- M. Install fixtures securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting).
- N. Install suspended luminaires and exit signs using pendants supported from swivel hangers. Provide pendant length required to suspend luminaire at indicated height.
- O. Support luminaires larger than 2 x 4 foot size independent of ceiling framing.
- P. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prevent movement.
- Q. Exposed Grid Ceilings: Support surface mounted luminaires in grid ceiling directly from building structure.
- R. Install wall mounted luminaires and exit signs at height as indicated on Drawings.
- S. Install accessories furnished with each luminaire.
- T. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within fixture; use flexible conduit.
- U. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.
- V. Bond products and metal accessories to branch circuit equipment grounding conductor.
- W. 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.
  2. Install lock-on device on branch circuit breaker serving units.
  3. Install pendant exit signs at height indicated. Where not indicated, mount 90 inches above finished floor in space over door frame where applicable
- X. Remote Drivers: Install in accessible location as indicated or as required to complete installation, using conductors per manufacturer's recommendations not exceeding manufacturer's recommended maximum conductor length to luminaire.
- Y. Identify luminaires connected to emergency power system in accordance with Section 26 05 53.

#### 3.04 FIELD QUALITY CONTROL

- A. Inspect each product for damage and defects.
- B. Operate each luminaire after installation and connection to verify proper operation.
- C. Test self-powered exit signs to verify proper operation upon loss of normal power supply.
- D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by LP Consulting Engineers, Inc..
- E. Re-lamp luminaires that have failed lamps at substantial completion.

#### 3.05 ADJUSTING

- A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by LP Consulting Engineers, Inc.. Secure locking fittings in place.
- B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by LP Consulting Engineers, Inc. or authority having jurisdiction.
- C. Air-Handling Luminaires with Air Control Blades or Heat Removal Dampers: Adjust as indicated or as required for proper airflow as directed by LP Consulting Engineers, Inc..

- D. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by LP Consulting Engineers, Inc. or authority having jurisdiction.
- E. Aim and adjust fixtures as indicated and/or as directed by the Architect or Electrical Engineer of Record.
- F. Position exit sign directional arrows as indicated.

### 3.06 CLEANING

- A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.
- B. Clean electrical parts to remove conductive and deleterious materials.
- C. Remove dirt and debris from enclosures.
- D. Clean finishes and touch up damage.
- E. Clean photometric control surfaces as recommended by manufacturer.

### 3.07 CLOSEOUT ACTIVITIES

- A. Demonstration: Demonstrate proper operation of luminaires to LP Consulting Engineers, Inc. or designated representative, and correct deficiencies or make adjustments as directed.
- B. Just prior to Substantial Completion, replace all lamps that have failed.

### 3.08 PROTECTION

- A. Protect installed luminaires from subsequent construction operations.

### 3.09 SCHEDULE - SEE DRAWINGS

END OF SECTION



## SECTION 27 00 00 - COMMUNICATIONS ADMINISTRATION

### PART 1 GENERAL

#### 1.1 SUMMARY

- A. The work outlined in this specification section is the general administrative overview for all communications systems installed under Division 27 and Division 28.

#### 1.2 SCOPE

- A. Submittals
- B. Contractor Installation Shop Drawings
- C. Warranty, Testing, and Commissioning
- D. Contractor Record Closeout Documents

#### 1.3 RELATED REQUIREMENTS

- A. Division 27, Communications
  - 1. Division 27 05 00 – Common Work Results for Communications
  - 2. Division 27 11 00 – Communications Equipment Rooms and Enclosures
  - 3. Division 27 15 00 – Communications Horizontal Cabling
  - 4. Division 27 16 00 – Communications Connecting Cords

#### 1.4 CODES AND STANDARDS

- A. The installed system shall confirm to all California State Codes
  - 1. 2025 California Building Code (CBC)
  - 2. 2025 California Electrical Code (CEC)
  - 3. 2025 California Fire Code (CFC)
  - 4. All equipment connected to the Fire Alarm system shall have California State Fire Marshall listing(s).
- B. National Codes
  - 1. 2025 NFPA 70 – National Electrical Code

2. 2025 NFPA 72 – National Fire Alarm Code
  3. 2025 NFPA 101 – Life Safety Code
  4. Americans with Disabilities Act (ADA)
  5. Local building codes
- C. All requirements by the authority having jurisdiction (AHJ)
- D. Telecommunications Industry Association Standards (TIA)
1. TIA 526-7: Single Mode Fiber Standards
  2. TIA 526-17: Multi Mode Fiber Standards
  3. TIA-568-D.1: Commercial Building Telecommunications Cabling Standards.
  4. TIA-568-C.2: Balanced Twisted-Pair Telecommunications Cabling and Components Standards.
  5. TIA-569-E: Telecommunications Pathways and Spaces.
  6. TIA-606-C: Administration Standard for Telecommunications Infrastructure.
  7. TIA-607-D: Generic Telecommunications Bonding and Grounding (Earthing) Requirements for Customer Premises.
- E. Audio-Visual and Integrated Experience Association (AVIXA)
1. A102.01.2017: Audio Coverage Uniformity in Listener Areas (ACU)
  2. 10:2013 Audio-Visual System Performance Verification
  3. F501.01:2015: Cable Labeling for Audio-Visual Systems
  4. V201.01: Projected Image System Contrast Ratio
  5. F502.02:2018: Rack Building for Audio-Visual Systems
  6. A103.01: Sound System Spectral Balance
  7. A104.01: Sound System Dynamic Range

## PART 2 PRODUCTS

2.1 N/A

## PART 3 EXECUTION

### 3.1 SUBMITTALS

#### A. Products Material Submittal:

1. Product data and manufacturer's installation instructions for information, communications, and technology systems electronically in PDF and XLS format, as required. The PDF shall include bookmarks for each section of the submittal.
2. A Microsoft Excel spreadsheet listing each item submitted as a separate row. The spreadsheet shall, at a minimum, contain the following columns:
  - a. Submittal #,
  - b. Item # (tied to PDF cut sheet)
  - c. Spec section submitted
  - d. Drawing sheet referenced
  - e. Manufacturer
  - f. Part number
  - g. Description

#### B. Products Material substitutions

1. If the Contractor desires to use any other brand or manufacturer of equal quality and utility to that specified, they shall make application to the District/Architect/Engineer in writing, and shall submit samples, if requested. Such application constitutes a recommendation that the Contractor:
  - a. Has investigated proposed product and determined that it meets or exceeds, in all respects, specified product.
  - b. Will provide the same warranty for equal as for specified product.
  - c. Will coordinate installation and make other changes, which may be required for work to be complete in all respects.
  - d. Waives claims for additional costs, which may subsequently become apparent.

- e. The Architect/Designer/Engineer will determine whether or not the proposed material is equal in quality and utility to the material specified, and their decision shall be final.
- f. Requests for equal materials will only be considered when offered by the Contractor as required by this section

C. Whenever in the Contract Documents any materials, products, processes, or articles are indicated or specified by the name brand of the manufacturer, or by patent or proprietary names, such specifications shall be deemed to be a measure of quality and utility or a standard and shall be deemed to be followed by the words, "or equal." It is the intent of this article to comply with Public Contract Code Section 3400.

### 3.2 CONTRACTOR INSTALLATION SHOP DRAWINGS

#### A. Contractor installation "Shop Drawings" requirements

1. The Contractor Installation Shop Drawings represent the level of system design to be provided to the District/Architect/Engineer. Contractor shall provide all additional system design work required, including:
  - a. Conduit layout and sizing.
  - b. Wire and cable layout and sizing.
  - c. Point-to-point wiring and equipment hook-up information.
  - d. Equipment mounting details.
    - 1) Design of equipment cabinets, including front rack elevations with accurate equipment rack unit spacing and equipment schedules.
    - 2) MDF / IDF room wall elevations for all systems, junction boxes, wall mounted equipment, power outlets etc., mounted on each wall.
    - 3) MDF / IDF room top view to show placement of equipment racks or cabinets, including required 36" clearance from mounted equipment.
  - e. Other detailed design work required.
  - f. Contractor's design shall conform to all applicable codes and ordinances. All electrical design, including the sizing and placement of conduit, raceways and conductors, shall be in accordance with

NFPA 70: National Electrical Code, current version, unless local codes establish more stringent requirements.

- g. Contractor's design work is subject to review and approval by the District/Architect/Engineer, Project Construction Manager.
2. It shall be understood that the drawings, details, and one-lines provided with the design package are diagrammatic and/or performance based. Data presented on design drawings are as accurate as preliminary surveys and planning can determine until final equipment selection is made. Accuracy is not guaranteed and field verification, of all dimensions, routing, etc., by the contractor is required.
3. Drawings are provided to show the intent of the design and specification and to assist the contractor in submitting a bid. Contractor is directed to make field surveys as part of his work prior to submitting systems installation shop drawings. The contractor shall make allowance in the proposal to cover whatever work is required to comply with the intent of the design and provide a fully functioning complete, operable, and integrated system.
4. In case of doubt of work intended, it is the responsibility of the Contractor to request instructions from the District/Architect/Engineer prior to bid. The contractor shall be responsible for installing a complete, operable, integrated and functioning system to the Districts satisfaction.
5. Installation of the systems shall not be started until detailed contractor furnished shop drawings (in AutoCAD 2020 or similar professional drawing format) and product submittals have been approved by the designer and/or architect and if (a. Applicable, approved by the Division of the State Architect).
6. Any and all design and/or installation discrepancies, change orders, (including labor, materials, and shipping) incurred without contractor shop drawings or after contractor shop drawings have been approved shall be the sole responsibility of the contractor.
7. Any work performed without approved contractor furnished shop drawings and submittals shall not be allowed. If work performed prior to approve shop drawings, contractor will do so at their own risk.

### 3.3 WARRANTY, TESTING, AND COMMISSIONING

#### A. Warranty:

1. All components, parts, and installation supplied by the contractor shall be guaranteed against defects in materials and workmanship for one (1) year from date of Notice of Completion or system acceptance, whichever falls later. Labor to repair, reprogram, or replace components shall be furnished by the contractor at no charge during the warranty period.
2. All warranty work of a minor nature shall be performed during hours when site and/or buildings are not occupied, Monday through Friday. Major warranty work, defined as, affecting more than 15% of the system, causing complete operator workstation or server failure, or work involving life safety shall be responded to within four (4) hours. Major warranty work shall be performed regardless of normal work hours or days until corrected.
3. Copper (Cat6A) network cabling installs for this project shall carry a CommScope SYSTIMAX Network Infrastructure 25-year extended product and application warranty certificate. This will require the contractor to certify their installers to the manufactures guidelines and submit their certifications with bid documents for the project.

### 3.4 CONTRACTOR RECORD CLOSEOUT DOCUMENTS

- A. The Contractor shall provide, at the completion of the project, Project Record Documents and furnish to the District one (1) Electronic Copy set of record drawings. The Contractor Record Closeout Documents shall be prepared in such a manner that each ASI, RFI, CCD, PCO is noted and clouded on the Contractor Record Closeout Documents.
- B. The Contractor shall provide an electronic copy of the field redline drawings in PDF format.
- C. The electronic Contractor Record Closeout Documents shall follow the following standards:
  1. Delivered as an electronic set of documents on a CD-R or a memory stick clearly labeled with Job Number, Bid Number and Name of Project.
  2. Drawing standards, such as line-types, line-weights, fonts and symbols shall be consistent with the bid set documents.
  3. Include text "Record Drawing" or "As Built" on all sheets.

4. Include all revision deltas and clouds on all sheets.
5. AutoCAD files shall adhere to the following standards:
  - a. Full drawing package in AutoCAD (AutoCAD 2020 or most current version), executable .dwg format
  - b. Include all fonts and plotting line-weights
  - c. Include all cross references
- D. The Contractor shall prepare and provide a complete Electronic Cable Book (PDF format), submitted on CD or electronically, as documentation. This cable book shall consist of the following with each section bookmarked within the PDF file:
  1. Title of project
  2. Index page detailing the sections
  3. Site plans (Record set redlined drawings on original full-size bid set plans, hard and soft copy)
  4. The drawings shall depict, at a minimum, the following conditions:
    - a. Division 27 systems as applicable
- E. Final inspection will not be made until drawings are received and approved. Record Drawings shall include "As-Built" one-line and wiring diagrams, with terminations identified, wire color coding schedule, pull box locations, and conduit routing plans.
- F. Warranty certificates and documentation.
  - a. One (1) Year workmanship warranty
  - b. Limited Lifetime manufacturer warranty for Fiber Optic plant.
  - c. Limited Lifetime manufacturer warranty for Cat6/Cat6A copper plant.

END OF SECTION



## SECTION 27 05 00 - COMMON WORK RESULTS FOR COMMUNICATIONS

### PART 1 GENERAL

#### 1.1 SUMMARY

- A. The work of this Section consists of basic materials and methods for all communications, technology, security, access control pathways work included under Division 27. Additional specification requirements for electrical work are specified under other sections of Division 26 and where those requirements differ from the requirements of this section, the more stringent shall govern.

#### 1.2 RELATED REQUIREMENTS

- A. Division 26 specification sections, as applicable
- B. Division 27, Communications
  - 1. Division 27 00 00 – Communications Administration

### PART 2 PRODUCTS

#### 2.1 GENERAL

- A. All products used on this project shall bear the label and be approved by Underwriters Laboratories "UL" unless otherwise approved in writing by the District/Architect/Engineer.
- B. Any modification that voids the equipment's UL listing is strictly prohibited (i.e. relocated or oversize knock-outs).
- C. Any modified new equipment that voids the UL listing shall be replaced by the Contactor (parts and labor) at their expense.
- D. All products shall be new and unused and shall be of manufacturer's current and standard production.
- E. Where two or more equipment items of the same kind are provided, all shall be identical and provided by the same manufacturer.
- F. Drawings and specifications indicate major system components, and may not show every component, connector, module, or accessory that may be required to support the operation specified. Contractor shall provide all components needed for complete and satisfactory operation.
- G. Product Availability:

1. Contractor, prior to submitting a proposal, shall determine product availability and delivery time, and shall include such considerations into his proposed Contract Time.
2. Certain products specified may only be available through factory authorized dealers and distributors. Contractor shall verify his ability to procure the products specified prior to submitting a proposal.
3. Equipment shortages, all equipment and material shall be ordered upon District/Architect/Engineer and design professional approval of product submittals and contractor shop drawings. The contractor shall immediately notify the District/Architect/Engineer of any long lead or backordered items so an alternate substitution may be reviewed for approval prior to ordering.

## 2.2 RACEWAYS

- A. Rigid Steel Metallic (GRC): Full weight with threaded fittings conforming to industry standards. Rigid steel conduit in contact with earth or in concrete slabs must be PVC wrapped.
  1. Rigid Steel Conduit: Protected inside and outside by galvanizing or sherardizing. By Triangle, Western Pipe & Tubing, Republic or approved equal. Risers and 90-degree elbows shall be wrapped with 3M Scotchwrap 51 PVC-based tape and 3M pipe primer (cover exposed threads and couplings).
- B. Electric metallic tubing (EMT): Protected inside and outside by galvanizing or sherardizing. Minimum diameter size for EMT is  $\frac{3}{4}$ " and maximum diameter is 4". Same manufacturers as for rigid steel conduit. All fittings by: Thomas & Betts, Steel City, Raco, OZ/Gedney, or approved equal.
- C. Raceway Fittings:
  1. Rigid Steel Conduit (GRC): Fittings, such as couplings, connectors, conduit bodies, elbows, bends, etc., shall be subject to same requirements as for rigid steel conduit. Couplings and unions shall be threaded type, assembled with anti-corrosion, conductive anti-seize compound at joints, and made absolutely tight to exclude water. Unions shall be equal to Crouse-Hinds UNY, UNF or approved equal.
  2. EMT: Fittings for indoor use: couplings and connectors  $\frac{3}{4}$ " and larger shall be steel setscrew type or threaded compression type.  $\frac{3}{4}$ " and larger, and all outdoor applications shall be compression type. All connectors must have insulated throats.

3. Flexible Metallic Conduit: Angle wedge type with insulated throat.
4. Bushings: Metallic insulated type. Weatherproof, liquid-tight, dust-tight installations with sealing ring and insulated throat, Crouse-Hinds, OZ/Gedney type "KR".
5. Expansion and Deflection Fittings: OZ/Gedney, Type "DX" or accepted equal.

## 2.3 BOXES

- A. Interior Junction boxes, larger than 8" square, located indoors shall be NEMA rated, with hinged door and an Allen key type lock kit.
- B. Exterior Junction boxes, larger than 8" square, located outdoors, or in wet or damp locations shall be rated NEMA-3R, with hinged door and cylinder lock kit keyed to match the site's master key.
  1. Grade level or below: Watertight and concrete-tight of cast iron construction, FSR FL series, Walker 880CS series or equal.
  2. Above grade level: Concrete-tight of stamped steel construction, FSR FL series, Walker 880S series or equal.

## 2.4 PULL LINE

- A. Furnish and install pull line in all new unused (empty) raceways / conduits.
- B. Furnish and install replacement pull lines in all raceways if new cables are pulled through them.
- C. All pull lines shall be:
  1. Permanently tagged with identification at both ends.
  2. Minimum 1/8" diameter, or larger if so, designated on plans, braided line of polypropylene or Jet-Line #232, or approved equal line of continuous fiber polyolefin. Minimum breaking strength of 1/8 in. line: 200 lbs.

## 2.5 PENETRATIONS AND SLEEVES

- A. All penetrations through fire rated assemblies (walls, ceilings and floors) shall be made with materials and/or sleeves that meet or exceed the fire rating of the assembly.
  1. Approved products: Specified Technologies, Inc. EZ-Path series, sealants, putty and pads.

- B. All penetration through non-rated partitions shall be made with conduit sleeves (see Raceway/EMT above) and sealed with draft stop material.

## PART 3 EXECUTION

### 3.1 PATHWAYS AND RACEWAY

- A. EMT conduit may be used at following locations:
  - 1. In dry in-wall spaces.
  - 2. In partitions other than concrete or solid masonry.
- B. In exterior locations, except as noted in 3.01.B.
- C. Rigid steel conduit and fittings shall be used for vertical risers and on top of all roofs, overhangs, walkways and canopies.
- D. All raceways installed in interior exposed locations shall be surface mounted raceway (Wiremold) by Legrand.
- E. Provide flexible connections of short length (4 foot maximum) to equipment subject to vibration or movement and to all motors. Provide a separate bonding conductor in all flexible connections, except as provided for in CEC 250-91 (b) Ex1.
- F. Portable buildings shall have weather-proof flex transition from underground to building conduits for both high/low voltage systems.
- G. Install exposed conduit run neatly, parallel to or at right angles to structural members. Maintain a minimum of 12 inches of clearance from steam or hot water pipes. All installed unistrut / strut channel supports should allow for future conduit attachments. The width of unistrut / strut channel to match the width of the closest attached junction box. See drawing details for attachment requirements.
- H. Supports: Support conduit with two-hole straps or unistrut / strut channel where shown and/or specified. Coordinate supports with architectural details. Secure to wood structure by means of bolts or lag screws, to metal by means of shallow self-tapping screws, to concrete by means of insert or expansion bolts, to brickwork by means of expansion bolts, and to hollow masonry or stucco by means of toggle bolts. Straps, expanders and shields shall be steel or malleable iron.
- I. Spacing for all EMT and rigid steel conduit supports shall be as follows unless otherwise specified in drawing details:

1. Surface conduits, roof mounted:
  - a. Spacing of supports shall comply with CEC Article 344, Table 344-30(B)(2).
  - b. Construction of roof supports shall comply with roofing manufacturer's requirements.
  - c. Roof supports shall be securely fastened to the roof with a gluing system approved by the roof manufacturer.
  - d. Route conduits parallel with mechanical piping and along building lines.
  - e. Provide ground wire in conduits.
2. Surface conduit spacing and supports and unless otherwise specified or shown on drawing details:
  - a. EMT – Size 1-1/4" to 1-1/2" – 4' maximum spacing (3 each supports per 10' conduit length) and 12" from each end of conduit at coupling, connector or 90-degree bend.
  - b. EMT – Size 2" to 4" – 4' maximum spacing (3 each supports per 10' conduit length) and 12" from end of conduit at coupling, connector or 90-degree bend.
  - c. Rigid steel – Size 3/4" to 1" – 4' maximum spacing (3 each supports per 10' conduit length) and 12" from each end of conduit at coupling, connector or 90-degree bend.
  - d. Rigid steel – Size 1-1/2" to 2" – 10' maximum spacing (1 each supports per 10' conduit length) and 12" from end of conduit at coupling, connector or 90-degree bend.
  - e. Rigid steel – Size 3" to 6" – 10' maximum spacing (1 each support per 10' conduit length) and 12" from end of conduit at coupling, connector or 90-degree bend.
- J. Do not install conduit in the "section" of concrete slabs, except for perpendicular penetrations. Refer to Structural Drawings for specific details.

- K. Above ground conduits shall have a minimum inside bend radius as follows unless otherwise specified:

| <u>CONDUIT SIZE</u><br><u>(INCHES - NOMINAL)</u> | <u>MINIMUM BENDING RADIUS</u><br><u>(TIMES CONDUIT SIZE)</u> |
|--------------------------------------------------|--------------------------------------------------------------|
| 2" AND SMALLER                                   | 6" INCH                                                      |
| 2" – 4"                                          | 24" INCH                                                     |

- A. If conduit is designated for low voltage use, no more than a total of 270 (3 ea. 90-degree bends, max.) degrees of conduit bend radius will be allowed between boxes.
- B. All junction boxes shall be connected to conduits using appropriate connecting hardware (i.e. box connectors)
- C. The use of conduit body LB, SLB or LBT fittings for information, communication, and technology systems is strictly prohibited.
- D. Clean, prepare, and paint all exposed conduit, junction boxes, unistrut, fittings and accessories except rooftop mounted rigid steel conduit to match the surface in which it is installed.

## 1.2 EXPANSION JOINTS

- A. Provide conduit expansion fitting in each conduit run, which is mechanically attached to separate structures to relieve strain caused by shift of one structure in relation to another.
- B. Provide conduit expansion fitting in each conduit run wherever it crosses expansion joint in structure to which it is attached.
- C. Provide expansion fittings where expansion and contraction are a consideration in long runs of exposed conduits (one inch [1"] or larger conduit in excess of one hundred feet [100']).

## 1.3 PROOFING

- A. Before pulling any conductors into a PVC conduit, the conduit shall be first be proofed by pulling through a mandrel of a diameter  $\frac{1}{4}$  in. smaller than the conduit inside dia., followed by a swab of the same diameter as the conduit inside diameter. Proofing will be done in the presence of Construction Manager for verification.

## 1.4 SURFACE MOUNTED RACEWAYS

- A. Surface mount non-metallic raceways shall be used as required to provide communications cabling services as shown on installation drawings.

- B. The Contractor will provide and install all surface mounted non-metallic type raceway and appropriate fittings to provide a safe and complete installation. All installation must meet manufacturers recommended installation procedures.
- C. All non-metallic raceway boxes, bases, covers and fittings shall be of the same manufacture.
- D. Wire management clips shall be installed in all raceways (vertical and horizontal runs) on maximum of 24" on center spacing. If utilizing existing raceway for new wires, wire management clips shall be installed.
- E. The non-metallic raceway components shall meet all of the CEC applicable articles.
- F. Multiple channel surface mounted raceways shall be color-coded and marked with a permanent marker on the inside of the channel and across the entire length of the channel blue for data, telephone, and IPTV and red for power. These color-coded channels shall be installed consistently with the same relative position of color on the top and the bottom throughout the site in accordance with CEC Article 352-26.
- G. The non-metallic raceway may have a factory-applied adhesive for mounting to the substrate. The contractor shall not use the factory-applied adhesive, instead the Contractor shall fasten raceways every 16" on center to studs wherever possible utilizing appropriate fastening methods by the manufacturer. The contractor shall use pan head type screws, sized in accordance with the manufacturer installation instructions. In addition to the manufactures mounting instructions, mounting hardware and anchor types recommended for any raceway that shall be mounted to the building or structure.
  - 1. Sheet rock / drywall / wall board: by means of Easy Anchor, toggle bolt, other spread type anchor with load distribution, or approved equal.
  - 2. Concrete / cinder block / solid masonry: by means of expanding compression type lag, expanding compression type bolt, expanding compression type all tread with nuts, or approved equal.
  - 3. Tile / Stucco / hollow masonry: by means of toggle bolts or approved equal.
  - 4. Wood: by means of lags, pan head wood screws, or approved equal.
  - 5. Metal: by means of a clamp, self-tapping pan head screw, or approved equal.

- H. The raceway is to be manufactured of rigid PVC compounds. The cover shall have a matte texture.
- I. A full complement of fittings must be available including, but not limited to, extension boxes, 90-degree elbows, tees, inside corners, outside corners, fixture boxes, wire clips, and device boxes. All fittings must match the color of the raceway cover.
- J. The raceway and all system components must be UL Listed and exhibit non-flammable self-extinguishing characteristics.
- K. At locations where raceway is mounted below 48 inches from the finished floor the contractor shall install a device bracket every 30" on center throughout the entire length of the raceway system. Any unused slots on the device bracket shall have a blank plate installed.
- L. Do not use pulling means, including fish tape, cable or rope, which can damage the non-metallic surface raceway.
- M. Raceway shall not have covers installed until fastening and cabling is approved by the inspector of record.

#### 1.5 POWER AND COMMUNICATION POLE

- A. In areas with system furniture and/or office furniture is set up in open areas, the cables shall be routed through an existing power pole, or a contractor supplied and installed power pole from the ceiling space to the floor.
- B. Power pole shall be properly anchored to the ceiling and the floor using the recommended mounting instruction from the manufacture.
- C. Contractor may utilize an existing power pole provided fill capacities are not exceeded.
- D. Project manager or District/Architect/Engineer representative shall determine how system furniture areas will need to be fitted with a power pole device.
- E. In the event that a power pole is not in place to serve the specific systems furniture area, the contractor is required to provide and install one.
- F. Contractor shall obtain clarification if method of installation is unclear regarding how a power pole will be installed prior to submission of contractor's bid.
- G. Where cables pass through a hole in the pole, the contractor shall provide and install a grommet around the hole in the power pole to protect the wire and cable. The grommet will be fitted with either a plastic or rubber shutter

device that provides a tight seal around the wire and cable. In addition, the contractor shall provide and install a spiral wrap type plastic device, which shall serve as a protected raceway from the power pole to the system furniture. The contractor shall then route the cables into the systems furniture raceways to the designated point of attachment at each drop location.

- H. The contractor will terminate the wire and/or cable on the device outlets, which will be installed in the appropriate manner for the type of furniture being installed.

## 1.6 FLOOR MONUMENTS

- A. Contractor shall provide and install approved floor monuments in those areas that cables are routed below the floor space and or require termination of a drop outlet in an open area that cannot be served either by a fixed wall or power pole.
- B. Contractor shall provide all necessary labor and materials to saw cut floor, core holes and patch substrates/surfaces necessary to accommodate the installation of a floor monument.
- C. Contractor shall provide and install a floor monument as specified in construction documents.
- D. Where cables pass through a hole in the monument, the contractor shall provide and install a grommet around the hole in the power pole to protect the wire and cable. The grommet will be fitted with either a plastic or rubber shutter device that provides a tight seal around the wire and cable. In addition, the contractor shall provide and install a spiral wrap type plastic device, which shall serve as a protected raceway from the monument to the system furniture. The contractor shall then route the cables into the systems furniture raceways to the designated point of attachment at each drop location.
- E. The contractor shall then route the cables into the systems furniture raceways and/or office furniture setup in open areas to the designated point of attachment at each drop location. The contractor will then terminate these cables on device outlets which will then be installed in a high-profile box, which will be surface mounted to the underside of the work surface at each location.

## 1.7 EXCAVATING, BACKFILLING AND COMPACTING FOR UTILITIES

- A. Excavating, backfilling and compacting for conduit, underground pull boxes, vaults and other underground electrical and low voltage utilities shall be

performed in accordance with Utilities and the Geotechnical Engineering Consultant.

#### 1.8 CONDUIT CAPPING

- A. Cap conduits during construction with manufactured seals. Swab out conduits before wires are pulled in.
- B. Cap all empty conduits below grade and in pull boxes with manufacturer's caps to prevent entrance of debris, attach pull string to cap.

#### 1.9 CONDUIT PENETRATIONS

- A. Penetrations through walls, ceilings, or floors.
  - 1. Wood, stucco, drywall, and hollow masonry
  - 2. Scanning for structural members and wall studs:
    - a. Contractor shall scan the wall for studs and metal using an electronic stud finder to avoid drilling through a structural member.
    - b. If the contractor is unsure of the building's structural supports, the contractor shall notify the inspector of record and/or project manager to confirm the location before drilling.
  - 3. Drilling
    - a. A pilot hole not exceeding 3/8" diameter shall be drilled through the material for each penetration to confirm placement of penetration on both sides of the wall and before using an auger bit or hole saw to finalize penetration size.
    - b. Final penetration sizes shall take into account the size of the conduit to be installed including box connectors if EMT and angular space requirements for fire or draft stopping.
  - 4. Concrete, brick, and solid masonry
    - a. X-ray scanning
      - 1) Contractor shall perform or hire out to have each location of each wall penetration x-rayed to confirm the locations of rebar and other structural steel supports.
      - 2) If the contractor is unsure of the building's structural supports, the contractor shall notify the inspector and/or project manager to confirm the location before drilling.

b. Core boring/ Drilling

- 1) Contractor shall notify the inspector and/or project manager of the time the core boring/drilling will be performed.
- 2) The contractor shall save all removed material from wall for inspection. Contractor shall take precautions to protect site property from water and debris created by core boring.
- 3) Final penetration sizes shall take into account the size of the conduit to be installed including box connectors if EMT and angular space requirements for dry packing.

c. Filling angular space / dry packing

- 1) Contractor shall fill the angular space between the conduit and the wall with structural grout. The grout shall be even and uniform all the way around the conduit with no gaps or voids.

- B. Where conduit passes through walls, ceilings, or floors with connection points to junction boxes or raceway mounted to the same wall as the penetration provide rigid steel or IMC conduit treaded on both ends and secured in place with locking rings on both sides. Bend radius requirements shall be maintained where penetrations are made through the back of raceways; junction boxes with adequate depth shall be installed in order to comply with this requirement.
- C. Where conduit passes through walls, ceilings, or floors with connection points to junction boxes or raceway not mounted to the same wall as the penetration provide EMT conduit and secured in place with unistrut / strut channel. Box connectors shall always be used to connect EMT to junction boxes and raceways.
- D. Where conduit passes through walls, ceilings, or floors with no connection points to junction boxes or raceway provide rigid steel or IMC conduit treaded on both ends and secured in place with locking rings and large reducing washers on both sides.
- E. Where conduit passes through finished walls or ceilings, provide steel escutcheon plates, chrome or painted, as directed. Conduit, which penetrate floor slabs, concrete or masonry walls shall be grouted and sealed watertight at penetrations.
- F. Fire stopping:

1. Seal all conduit penetrations through fire rated walls and floors fire and smoke tight in conformance with 2025 CBC Sections 714 & 2025 CEC 300-21.

G. Draft stopping:

1. All non-fire rated walls must be draft stopped and sealed. Submit method to be used for approval by inspector and/or project manager. Mineral wool is one product that may be used.

H. Water stopping:

1. All exterior penetrations shall be sealed watertight. The contractor shall use silicon rubber caulk or other approved methods and materials. Submit method and material with inspector and/or project manager.
- I. Provide 12" vertical and horizontal clearance for conduit risers through roofs. Coordinate with roof manufacturer to seal roof.

#### 1.10 DEMOLITION

- A. Any existing equipment and cable noted to be removed on design plans or abandoned devices and conduit not being reused by this project shall be removed by the Contractor.
- B. Removed equipment shall be inventoried and turned over to the District/Architect/Engineer or disposed of per the project's instructions.
- C. Disturbed surfaces shall be repaired to match original surface condition and prepped for painting.
- D. Blank electrical plates colored or painted to match existing surfaces shall be installed over abandoned flush mounted device boxes.

#### 1.11 BOXES

- A. Screws shall be used to attach boxes, and must be accurately placed for finish, independently and securely supported by adequate wood backing or by manufactured adjustable channel type heavy-duty box hangers. Boxes with metal box hangers shall be attached to metal studs. Box hangers shall be securely tied or welded (where permitted) to metal studs. Paint weld with rust inhibitor. Boxes installed in masonry tile or concrete block construction shall be secured with auxiliary plates, bars or clips and be grouted in place.
- B. Locate outlets at the following heights above floor to the center of the device or handle unless otherwise noted on Drawings, Specifications, 2025 CBC 11B-308 or as required to meet ADA handicap requirements.

- a. Convenience Outlets: 18" AFF (6" above counter or splash not to exceed 40" above finished floor).
- b. Telephone Outlets: 18" AFF (45 in. for wall phone).
- c. Install pull boxes as required in accessible spaces but do not install in finished areas unless approved by the District/Architect/Engineer.
- C. Outlet boxes on opposite sides of wall requiring protected openings shall be separated by a horizontal distance of twenty-four (24") inches, Title 24 Part 2, 713.3.2 Exception #1.
- D. For sound control, separate outlets on opposite sides of walls 16" minimum. Where outlets are less than 16" or in sound rated walls, seal airtight with fire rated sheet putty pads. Fill gap between junction box and wall with acoustical sealant all around perimeter of junction box. Fill conduits larger than 1 1/4" with fire rated putty.
- E. Installation of conduit and outlet boxes in fire-resistive walls and partitions shall comply with Title 24, Part 2, Section 713.
- F. Installation of conduit and outlet boxes in fire-resistive floors, floor-ceiling or roof-ceiling assemblies shall comply with Title 24, Part 2, Section 713.

#### 1.12 GROUNDING AND BONDING

- A. Ground fittings shall be UL approved for each application as installed, installed and connected to system in accordance with 2025 CEC Code requirements.
- B. Neutral conductors and non-current carrying parts of equipment at each installation shall be grounded in accordance with applicable code. Ground conductor shall be copper having a current capacity in accordance with CEC Section 250.
- C. All equipment cases, motor frames, etc. shall be completely grounded to satisfy requirements of CEC. Install bond wire in flexible conduit. Install copper bond wire, sized in accordance with CEC, in all nonmetallic raceways and bond to all metallic parts using approved fittings.
- D. Service ground conductor shall be connected to a "Ufer" encased ground and bonded to the cold-water pipe system.
- E. Ground resistance of made electrodes shall not exceed 25 ohms, per CEC Article 250-84. Perform ground resistance test prior to connection.

F. All connections shall be made with solder less connectors or molded fusion-welding process. Solder less connections shall be made to conform to Code requirements or manufacturers requirements if more stringent.

G. Provide ground wire in all rooftop conduits.

#### 1.13 FIELD TESTING

A. General: Perform field test in the presence of the District's Representative except as otherwise specified. Provide required labor, materials, equipment and connections to perform tests. Document results and submit them to the District's Representative. Repair or replace all defective work.

B. Perform Megger test on all grounding legs:

1. Notify the District/Architect/Engineer when installed cable is ready to be tested.
2. Apply Megger tests. Supply labor, materials and test equipment required to perform continuity checks and Megger tests. Submit test data for approval.
3. If any failure is detected, locate failure, determine cause and, as directed by the District/Architect/Engineer, replace or repair cable or conductor to satisfaction of the District/Architect/Engineer at no increase in Contract Sum.
4. Subject feeder cables rated 600 volts AC to one (1) minute withstand test, or until stable reading is obtained with 1000-volt Megger. Provide written report of Megger test results. Test report to include all test conditions.
5. Do not Megger test any cables after connecting test equipment, unless specifically directed to do so by the District/Architect/Engineer.

#### 1.14 CLEANING, PATCHING, AND PAINTING

A. Brush and clean work prior to concealing, painting and acceptance. Performed in stages if directed.

B. Clean and repair soiled or damaged painted exposed work and match adjoining work before final acceptance.

C. Remove debris from inside and outside of material, equipment and structures.

D. All conduit, connectors, j-boxes, and accessories shall be painted white with primer.

- E. All mud-rings shall be color code painted for inspection.

#### 1.15 CABLING INSTALLATION AND DISTRIBUTION

- A. Cable shall be routed in appropriate conduit by system type as outlined in details. Contractor is to contact District/Architect/Engineer representative when this requirement can't be met.
- B. Cable shall not be exposed at any point in the cable path. Contractor is to use appropriate pathway for the situation (i.e. above drop ceiling, inside wall, conduit, or non-metallic surface raceway).
- C. Cables shall be protected and sleeved with a conduit in locations where cables need to pass through walls, floors, or hard ceilings. Contractor shall install rigid steel or IMC conduit threaded on both ends and secured in place with locking rings and large reducing washers on both sides. Bend radius requirements shall be maintained where penetrations are made through the back of raceways; junction boxes with adequate depth shall be installed in order to comply with this requirement. The fire rating of the wall must be maintained during and after installation.
- D. At solid wall locations such as plaster, brick, concrete, cinder block, tile, reinforced concrete, Contractor will provide and install surface mounted non-metallic raceways or equivalent. The use of different series raceways is required at locations where cable fill capacities are exceeded.
- E. Cables will be run vertically inside the wall and into the ceiling space. Terminations on stud walls will be accomplished with cut-in type electrical boxes with a 1" conduit (flex or EMT) extended from the box within the wall to ceiling access space.
- F. Cables routed above drop ceilings shall be run in corridors wherever possible in order to avoid furniture and work areas so that access to the cables is unencumbered.
- G. The cables are to be as accessible as possible, placed above all other items in the ceiling, including ducts and supports.
- H. Service loops:
  - 1. Service loops in Ground boxes and J-boxes shall not be installed unless with prior written approval or to allow for the minimum bend radius specified by the manufacturer:

2. Cables routed above drop ceilings shall be run in corridors wherever possible in order to avoid furniture and work areas so that access to the cables is unencumbered.
3. Intercommunications feeder cables:
  - a. Shall be routed around the perimeter of the backboard in which it is terminated on.
  - b. Shall be routed around the perimeter of the ground box as cable exits and enters each side of the ground box. No visible service loop required. Cable shall be secured to the side of the ground box and not rest on the bottom of the box.
4. Twisted Pair Category 6A cable:
  - a. Shall be a minimum of 6' at all MDF and IDF locations.
  - b. Shall be routed around the perimeter of the ground box as cable exits and enters each side of the ground box. No visible service loop required. Cable shall be secured to the side of the ground box and not rest on the bottom of the box.
  - c. Shall be a minimum of 9" behind each station location.
5. Service loops, Intercommunications:
  - a. Horizontal cables:
    - 1) Shall be a minimum of 3' at all head end termination locations.
    - 2) Shall be a minimum of 12" behind each speaker.
    - 3) Feeder/Backbone cables shall be routed around the perimeter of the backboard in which it is terminated on.
  - I. The cables are to be as accessible as possible, placed above all other items in the ceiling, including ducts and supports.
  - J. Do not use pulling means, including fish tape, cable or rope, which can damage the non-metallic surface raceway.
  - K. Use pulling compound or lubricant, with prior District/Architect/Engineer approval, only when necessary.
  - L. Pulling compound shall be a water base pulling lubricant that will not deteriorate cable or conduit.

- M. Cables shall not be pulled across sharp edges. If sharp edges are present a small sleeve, insulating insert, or grommet shall be installed to protect the cable.
- N. Cables shall be pulled free of sharp bends or kinks.
- O. Cables shall not be forced or jammed between metal parts, assemblies, etc.
- P. Cables shall not be pulled across access doors and pull box covers. Access to all equipment and systems shall be maintained.
- Q. Manufacturer's specifications for pulling stress and minimum bend radius shall not be exceeded on any cable.
- R. Install or replace pull-string after installing cable in any EMT, IMC, Rigid, or PVC conduits.
- S. A maximum fill capacity of 40% will be deemed acceptable for conduits and 75% of raceway and surface pathway. Contractor shall inform District/Architect/Engineer / District/Architect/Engineer representative in writing if this requirement cannot be met. If the Contractor fails to inform the District/Architect/Engineer or its representative, any labor involve in rerouting cables in such conduit or raceways shall be the sole responsibility of the Contractor
- T. Cable shall be identified with a machine-printed tag identifying the system type, source or head end location, and destination location in all access points (i.e. junction boxes, ground boxes, MDF, IDF, etc.) and as they enter or exit the conduit pathway.
- U. Contractor will assess whether or not the ceiling space is a plenum air return, which shall dictate the use of the listed plenum type or PVC type cable required in the materials specification section. Any cable installations that shall be pulled through underground conduit will require Outside Plant (OSP) cable. OSP cable are limited to a length of 50' inside a building.
- V. Power feeds of greater than 220 volts shall not be run parallel to UTP, Speaker or other system cables. Parallel runs of greater than 20 feet require a minimum separation distance of 3 feet, or 18 inches if cables are contained in a metallic conduit, which is grounded.
- W. All power feeds crossing the path of UTP, Speaker or other system cables at right angles shall be a minimum of 6 inches in distance from the UTP cables.

- X. There shall be a 6-inch separation between the cables and the light fixtures and motors. Contractor will notify the District/Architect/Engineer or it's representative in the event this requirement cannot be met.
- Y. All cable/cabling shall be kept 6 inches away from any heat source, i.e., HVAC ducting, steam valves, etc.
- Z. Station Cable (UTP) or (STP) runs are not to exceed 290 feet.
- AA. Cable splicing at any point of any cable installed by the contractor is unacceptable without specific District/Architect/Engineer and designer approval.
- BB. No cabling is allowed to rest on any ceiling tile or suspension system unless specifically authorized by the District/Architect/Engineer. Strapping or mounting to any existing wires (e.g., lighting, ceiling grid, conduits, etc.) is not permitted.
- CC. Cables, regardless of classification, shall not be bundled in larger quantities than 24.
- DD. Cables bundled in quantities of 24 or larger shall be securely mounted to building structure (i.e. stud, beam, or other framing member.) with Contractor supplied cable tray unless otherwise specified on design drawings and details.
- EE. Cables bundled in quantities less than 24 shall be securely mounted to building structure (i.e. stud, beam, or other framing member.) with Contractor supplied J-hooks every 4 feet unless otherwise specified on design drawings and details.
- FF. Cables bundled in junction boxes shall be neatly routed and secured to box with Contractor supplied Velcro straps typically 4 per box.
- GG. Cables shall be securely supported to building structure (i.e. stud, beam, or other framing member.) within 12 inches of any conduit or raceway entrance or exit. Cable tray may be required if not noted on plans.
- HH. Contractor will place all UTP, Speaker and other system cables in the ceiling area on Contractor supplied and installed wire hangers or in floor spaces and raceways. Cable tray may be required if noted on plans.
- II. Insulation shall be removed to expose shielding and conductors/fibers to the exact length required by manufacturer for proper termination of plugs, pins and fiber terminations.

1. Wires and shielding shall not be nicked or damaged in any way upon termination of pins and closure of plug assembly.
2. Pins and plugs, upon termination, shall not be damaged in any way.

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## SECTION 27 15 00 - COMMUNICATIONS HORIZONTAL CABLING

### PART 1 GENERAL

#### 1.1 SUMMARY

- A. This section defines equipment, materials, accessories, installation, configuration and testing requirements for a complete and operational Communications Horizontal Cabling system. The system shall provide reliable high-performance data communication from the Main Distribution Frame (MDF) / Equipment Room (ER), Intermediate Distribution Frame (IDF) / Telecommunication Room (TR) or equipment control points to area workstations and communications device locations.

#### 1.2 SCOPE

- A. The work will include but not be limited to the following objectives:
  - 1. For new construction – provide, coordinate, and install all required components and accessories as outlined in the design documents for a complete and operable system.
  - 2. For existing construction – provide, coordinate, and install all components and accessories as outlined in the design documents to modify the existing system while maintaining compliance and to seamlessly integrate the new components into the existing system.
  - 3. Labor and Materials: The Contractor shall provide and pay for all labor, materials, equipment, tools, utilities, construction equipment and machinery, transportation and other facilities and services necessary for the proper execution, operation and completion of the scope of work.
  - 4. The Contractor shall furnish and install all new conduit/raceway and wire as indicated on the project drawings and/or as required to provide a fully functional system to the District/Architect/Engineer.
  - 5. The Contractor shall install new Category 6A (Cat 6A) data cabling, station outlets at locations as indicated on drawings. Terminations will be ANSI/TIA standard T568B wiring configuration into RJ45 workstation data jacks.
  - 6. The Contractor shall set up a complete wire management system at each MDF / ER, IDF / TR, this includes wire management organizer(s). Contractor shall provide the following:

- a. One (1) vertical wire manager for each equipment rack to be installed (height to match equipment rack overall units)
  - b. One (1) 1RU horizontal wire manager for each new Cat 6A patch panel
  - c. One (1) 1RU horizontal wire manager for each switch to be installed
7. The Contractor is required to adhere to current industry standards when distributing and terminating cables:
    - a. All Cat 6A cables shall be secured to the rear cable management bar that is included with each of the patch panels.
    - b. At the rear of the patch panel, 50% of the cables shall enter the patch panel area from the right side and 50% of the cables enter from the left side. Cables shall be bundled in groups no larger than 25 cables. All bundled cabling shall be similar type per cable separation guidelines.
  8. Prior to installation, If the length of the cable run appears to be exceeding 275' from station outlet to patch panel, the Contractor shall review requirement with Engineer.
  9. If applicable, existing systems shall remain operable until new systems are accepted and approved by the District/Architect/Engineer or its representative.
  10. All Category 6A (Cat 6A) installations shall carry a CommScope SYSTIMAX Network Infrastructure 25-year extended product and application warranty certificate (see Division 27 00 00 for requirements).

### 1.3 RELATED REQUIREMENTS

A. Division 26 specification sections, as applicable

B. Division 27, Communications

1. Division 27 00 00 – Communications Administration

## PART 2 PRODUCTS

### 2.1 GENERAL

- A. All products shall be new, unused and without blemishes and shall be of manufacturer's current and standard production.

- B. Contractor shall confirm all equipment part numbers with the District/Architect/Engineer prior to ordering equipment and updating submittals as required.
- C. Drawings and Specifications indicate major system components, and may not show every component, connector, module, or accessory that may be required to support the operation specified. Contractor shall provide all components needed for complete and satisfactory installation and operation.
- D. Product Availability
  - 1. Prior to submitting a project bid, the contractor shall determine product availability, delivery time, and shall include such considerations into the base bid for the communications systems scope of work as defined in the construction documents.

## 2.2 CONDUIT AND RACEWAY

- A. See specification section 27 05 00 for additional information and requirements

## 2.3 WIRE AND CABLE

- A. Provide all new wire and cable required to install systems as indicated on construction documents.
- B. Category 6A cable shall meet or exceed IEEE 802.3 for Gigabit Ethernet.
- C. Category 6A underground cable shall be rated for the application intended.
- D. Cable management system shall be installed to provide a complete management system.

## 2.4 LOW VOLTAGE ENCLOSURES AND PATHWAYS

- A. See specification section 27 05 00 for additional information and requirements

# PART 3 EXECUTION

## 3.1 INSTALLATION

- A. The cables will be routed to their respective Main Distribution Frame (MDF) or Building Distribution Frame (BDF), to Node Termination Point (NTP) utilizing the shortest path possible while maintaining right angles to the building structure.
- B. Data UTP:

1. Data terminations shall be T568B configuration.
2. Patch panels shall be installed in accordance with manufacturer's installation guidelines.
3. Patch panels will be CommScope SYSTIMAX 48-port Category 6A 360 DM panels.
4. Faceplates will be CommScope four-port M14L faceplates.
5. Labeling
  - a. **Handwritten labels are not acceptable.**
  - b. Cables shall be labeled no more than 4" inches back from each end of the termination point with a cable label that matches the station outlet labeling.
  - c. Wiring termination locations shall be labeled to corresponding pairs at the MDF / ER, IDF / TR, and at each station outlet end.
  - d. Contractor will provide tags, straps, and adhesive labels. These tags, straps, and adhesive labels shall be of high quality that will endure over time.
6. Labeling Scheme
  - a. Workstation labeling:
    - 1) The faceplate or surface block shall be labeled with the MDF / ER, or IDF / TR number (#), sequential station outlet number for the MDF / ER, or IDF / TR (ex. 1.1-09).
    - 2) The labeling itself shall be in a white background with black lettering.
  - b. MDF / IDF labeling:
    - 1) Patch panel shall be labeled with the sequential station outlet number to match station outlet labeling.
    - 2) The labeling itself shall be in a black background with white lettering.
  - c. Data UTP Testing
    - 1) All data UTP cable shall be tested after installation according to the procedures and acceptability criteria described in ANSI/TIA

Standards for Category 6A cable and connecting hardware. Test at level IIIe compliance or higher.

2) Data UTP cable shall meet or exceed requirements for 10Gbps for Cat6A.

3) Test results will be submitted per Section 27 00 00.

C. Manufacturer's specification for pulling stress and minimum bend radius shall not be exceeded on any Category cable.

D. Station Cable (UTP) or (STP) runs shall not exceed 295' feet (90 meters) on the permanent link.

### 3.2 CABLE

A. Design, layout, size, and plan new cable runs as required.

B. All wire and cable passing thru metalwork shall be sleeved by an approved grommet or bushing.

C. Conduit/raceway fill shall not exceed 40 percent of interior cross-sectional area.

D. Identify all cables at terminations. Identification shall be made with an approved permanent label, machine generated 1/4" black letters on white tape (Brady or equal.)

E. Underground cable shall be rated for use.

F. Neatly dress and secure / strap all cabling.

### 3.3 WARRANTY, TESTING, AND COMMISSIONING

A. Refer to Division 27 00 00 for requirements.

### 3.4 CONTRACTOR CLOSEOUT DOCUMENTS AND TEST RESULTS

A. Refer to Division 27 00 00 for requirements.

END OF SECTION

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Communications Horizontal Cabling  
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SECTION 27 16 00 - CONNECTING CORDS  
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## SECTION 27 41 00 - AUDIO-VISUAL SYSTEMS

### PART 1 – GENERAL

#### 1.1 SUMMARY

- A. Quality workmanship is a high priority for the District and the Contractor shall be held to a high-level of professional workmanship. Contractors unfamiliar with the District's standards shall familiarize themselves with the District's standards and requirements prior to beginning work.
- B. For new construction – provide and install all components and accessories as outlined in the design documents for a complete and operable system.
- C. Labor and Materials: The Contractor shall provide and pay for all labor, materials, equipment, tools, utilities, construction equipment and machinery, transportation and other facilities and services necessary for the proper execution, operation and completion of the Work.
- D. The Contractor shall furnish and install all new conduit/raceway and wire as indicated on the project drawings and/or as required to provide a turn-key system.
- E. The Contractor shall install wire and cable that is appropriate for the installed environment (i.e., non-plenum, plenum, underground & etc.)
- F. The Contractor shall be responsible for all programming, commissioning, and activation the Audio-Visual System.
- G. The Contractor shall review the proposed final system programming, functionality and expectations with the project manager, Architect/Engineer/Designer and District prior to final programming.
- H. After completion of the installation and pretest of the system a satisfactory final test of the entire system shall be performed by the contractor, in the presence of the District and project designer, to demonstrate system functionality and operation.

#### 1.2 RELATED REQUIREMENTS

- A. Division 26 specification sections, as applicable
- B. Division 27, Communications
  - 1. Division 27 05 00 – Common Work Results for Communications
- C.

#### D. Project Management

1. The Supplier/Installation Contractor will provide the following Project Management:
  - a. Attend meetings with the client's technical and contract representative, providing status reports and resolution of questions or issues outstanding.
  - b. Develop project schedule and oversight of the installation team.
  - c. Stage equipment and materials at supplier's shop.
  - d. Facilitate completion of final punch-list items.
  - e. Assure that the finished system meets the design criteria and functions per the developed concept.
  - f. Remote Control Programming
  - g. Contractor Qualification and Training
2. The Contractor shall be fully conversant and capable in the cabling of low voltage applications such as, but not limited to audio-visual, data, voice and imaging network systems. The Contractor shall at a minimum possess the following qualifications:
  - a. Possess those licenses/permits required to perform telecommunications installations in the specified jurisdiction.
  - b. Personnel trained and certified in the design of the approved manufacturer's products.
  - c. Personnel trained and certified to install the approved manufacturer's products.
  - d. The Contractor shall show proof of current certification of the approved manufacturer's products.
  - e. Provide references of the type of installation provide in this specification.
  - f. Personnel trained in the installation of pathways and support for housing horizontal and backbone cabling.
  - g. Personnel knowledgeable in local, state, province and national codes, and regulations. All work shall comply with the latest revision of the codes or regulations. When conflict exists between local or national

codes or regulations, the most stringent codes or regulations shall be followed.

- h. Be in business a minimum of Three (5) years.
- i. Must have personnel fluent in the use of Computer Aided Design and possess and operate Autodesk AutoCAD or Autodesk Revit BIM software using .DWG, .RVT, or .DXF format for required contractor shop and record as-build documents.
- j. Must possess current liability insurance certificates.

### 1.3 QUALITY ASSURANCE

#### A. Conformance:

1. All work shall conform to the applicable requirements of this project. A C-7 licensed Contractor in the State of California shall perform all low voltage work.
2. The A/V contractor shall be a factory direct dealer for, or establish an equivalent relationship with, the major equipment specified herein, suitable to carry out warranty administration and post warranty repair, and provide documentation of same
3. The Contractor shall notify the District, prior to submission of bid, about any part of the design, which fails to comply with abovementioned requirements.
4. If after contract is awarded, minor changes and additions are required by the mentioned authorities, even though such work is not shown on drawings or covered in the specifications, they shall be included at Contractor's expense.
5. The A/V contractor shall have been actively engaged in the installation of projects similar in scope and size for a minimum period of 5 years.
6. The A/V contractor shall be an active certified professional and provide documentation, of one or more of the following associations:
  - a. International Communication Industries Association (ICIA)
  - b. National Systems Contractors Association (NSCA),
  - c. Audio-Visual and Integrated Experience Association (AVIXA, CTS/CTS-I)

d. National Association of Broadcasters (NAB)

e. Building Industry Consulting Service International (BICSI)

7. Any subcontractors to the A/V contractor will be allowed provided they comprise no more than 20% of the on-site work force and are under the direct supervision of the Project Manager or Installation Supervisor.

B. Coordination:

1. The Contractor shall become familiar with the existing conditions at the job site if applicable, and with the drawings and specifications and plan the installation of the audiovisual work to conform to the existing conditions to provide the best possible assembly of the combined work of all trades.
2. The Contractor shall work out in advance all "tight" conditions, involving all trades and if found necessary, supplementary drawings shall be prepared by this Contractor, for the Architect's approval, before work proceeds in these areas.
3. No additional cost will be considered for work, which must be relocated due to conflicts with the work of other trades.

1.4 SUBMITTALS

A. Pre-construction material submittals

1. Products Material Submittal:

- 1) See Division 27 00 00 for Contractor Product Submittal requirements

2. Contractor Installation Shop drawings

- a. See Division 27 00 00 for Contractor Shop Drawing Installation requirements.

3. Post construction submittals

- a. Provide as-build documentation in accordance with Section 3.
- b. Submit District's manual binders of all equipment documentation.
- c. Provide a laminated simple operational sheet for end-users of system.
- d. See section 27 00 00 for requirements.

## PART 2 – PRODUCTS

### 2.1 CONTRACTOR PROVIDED PRODUCTS

- A. As indicated on drawings to provide fully functional, integrated, and operational Audio-Visual system.

### 2.2 CABLE

- A. Contractor must provide all cables and connectors from the wall plate to the TVs, projectors, speakers, switchers, amplifiers, and all other associated equipment to provide a fully functional, integrated and operational AV system.
- B. Speaker cable shall be minimum 14 awg, 2 conductor cable.

### 2.3 ENCLOSURES AND PATHWAYS

- A. The AV contractor shall install an equipment rack as required to house the equipment to be installed.
- B. Use mounting hardware and anchors recommended by the Engineer of any material that shall be mounted to the building or structure.
- C. The Contractor shall select the appropriate mounting bracket kits for existing and new construction installations.
  - 1) The Contractor will provide a cable conduit/pathway to accommodate the necessary connections as outlined in the drawings and details.

### 2.4 POWER

- A. The Contractor shall provide and/or repair electrical circuit(s), performed by C-10 licensed electrician), outlet(s) and connections where necessary to install the audio-visual and/or theatrical lighting DMX system.

## PART 3 – EXECUTION

### 3.1 CABLE ROUTING

- A. Cable shall be routed in appropriate conduit by system type as outlined in design details. Contractor is to contact District representative when this requirement cannot be met.
- B. Cable shall not be exposed at any point in the main cable path. Contractor is to use appropriate pathway for the situation (i.e., inside wall, conduit, or non-metallic surface raceway).

- C. Cables shall be protected and sleeved with a conduit in locations where cables need to pass through walls, floors, or hard ceilings. Contractor shall install threaded IMC or rigid conduit with large fender washers, lock rings, and screw on protective bushings on both ends.
- D. The fire rating of the wall must be maintained during and after installation.
- E. See Section 27 00 00 for additional requirements.

### 3.2 CABLE INSTALLATION PARAMETERS

#### A. Cabling

- 1. Cable shall be installed in a neat and orderly manner. Loose cable shall be bundled, and tie wrapped with Velcro Ties
- 2. All cables shall be terminated per drawing details provided by manufacturer.

#### B. Conduit and Raceway

- 1. A maximum fill capacity of 40% will be deemed acceptable for conduits.
- 2. Install or replace pull-string after installing cable in any EMT, IMC, Rigid, or PVC conduits.

#### C. Cables shall be identified with a machine-printed tag identifying the system type, source or head end location, and destination location in all access points (i.e., junction boxes, ground boxes, MDF, IDF, etc.) and as they enter or exit and conduit pathway. Handwritten labels shall not be accepted.

#### D. All cabling shall be installed with proper stress relief and tied down.

#### E. Manufacturer's specification for pulling stress and minimum bend radius shall not be exceeded on any cable.

#### F. See Section 27 00 00 for additional requirements.

### 3.3 SYSTEM IMPLEMENTATION

#### A. The installation contractor will fine tune and test the systems for optimal audio and visual performance.

#### B. Audio Signal:

- 1. Signal-to-Noise ratio (including crosstalk): 70 dB minimum.
- 2. Total Harmonic Distortion: 0.05% maximum from 20 Hz. To 18 kHz.

3. Frequency Response: +/- 0.5 dB, 20 Hz to 20 kHz.

C. Audio Reproduction:

1. Signal-to-Noise ratio (including crosstalk): 55 dB minimum.
2. Total Harmonic Distortion: 0.05% maximum from 20 Hz. To 18 kHz.
3. Frequency Response:
  - a. Speech reinforcement loudspeakers, 4" or 6" dia.: +/- 1 dB 100 Hz to 2.5 kHz rolling off at 6 dB/octave from 125 Hz to 80 Hz and at 2 dB/octave above 2.5 kHz as measured on axis of loudspeaker.
  - b. Speech reinforcement loudspeakers, 8" or 12" dia.: +/- 1.5 dB 125 Hz to 2.5 kHz rolling off at 6 dB/octave from 100 Hz to 63 Hz and at 2 dB/octave above 2.5 kHz as measured on axis of loudspeaker.
  - c. Program reproduction loudspeakers: +/- 2 dB, 63 Hz to 6kHz decreasing uniformly from a relative level of 0 dB at 6 Hz to a relative level -5 dB at 20 kHz as measured on axis of loudspeaker.
4. Speech Reinforcement Sound Output Capability: Provide program levels of at least 96 dB and speech reinforcement levels of at least 85 dB everywhere in the seating area without objectionable distortion, rattles or buzzes. Use several different samples of recorded music as test signals.
5. Test microphones at each input.
6. Set master output limiting at -3dB with 10:1 ratio.
7. Hum and Noise: Hum and noise shall be inaudible under normal conditions from anywhere in the seating area.

D. Video Signal:

1. Signal-to-noise ratio (peak to RMS) unweighted DC to 5.5 MHz: 55 dB minimum.
2. Crosstalk unweighted DC to 5.5 MHz: 45 dB minimum.
3. Line and Field tilt: 2% maximum.
4. Differential Gain: 3% maximum.
5. Differential Phase: 2 degrees maximum.

E. Video Timing:

1. System Timing: Sync coincidence within 50 nanoseconds.
  2. Color Timing: Within 2 degrees at 3.58 MHz
- F. Optical Performance:
1. The light fall-off from the center of the projected image to the four corners as measured at the projected image plane, shall not exceed 50%.
- G. The installation contractor will fine tune and test the systems for optimal performance.
- H. An District representative will be present to confirm system operation and to sign off on the system being complete.
- I. Provide a turnkey audio-visual system to include equipment and materials, submittals, testing, staff training and warranty.
- J. Installation shall include, but is not limited to engineering, labor and hardware for display, audio, video, control systems and related equipment rack, equipment mounting, plates, panels, connectors, cables.

### 3.4 TESTING AND ACCEPTANCE

- A. Upon completion of installation, and prior to final acceptance by the District, the A/V Contractor shall demonstrate to the satisfaction of the Consultant and the District, the full operational functionality of all systems, all inputs/output stations, and sub-systems installed.
- B. Qualitative performance tests may include, but not be limited to, audio residual hum, noise & distortion, video signal hum, noise, sync quality and color fidelity.
- C. Test equipment required for these tests shall be supplied by the contractor and coordinated in advance with the Consultant.
- D. This shall not preclude the consultant from utilizing his own test equipment to confirm measurement results.
- E. Punch list items must be resolved prior to final acceptance.

### 3.5 TRAINING

- A. The Contractor shall create quick start guides customized to the specific system being installed at each location. Quick start guides shall be prepared in advance of all training sessions so they can be distributed and reviewed with staff at time of initial training. All quick start guides shall be laminated.

- B. The contractor shall make a video recording of all training sessions and export to digital medium (USB Drive) for District archive.
- C. The Contractor shall provide 16-24 hours maximum of training for all large performance venue (theater, broadcast, gymnasium, stadium) installations. The Contractor shall be present for the first two (2) performances at large performance venue installations. Training shall occur over 5-7 days.
- D. The Contractor shall provide 8-12 hours maximum of training for all classroom, office and conference room installations. Training shall occur over 1-2 days.

### 3.6 CLOSEOUT DOCUMENTATION AND DRAWINGS

- A. See section 27 00 00 for requirements.
- B. Warranty certificates and documentation
  - 1. Workmanship Warranty - The Supplier/Installation Contractor will concur that the Audio-Visual System furnished to be free from defects in workmanship (i.e., cables, connections, and structures) failure for a period of Two (2) Years from the date of acceptance.
  - 2. Equipment Manufacturer Warranty - The Supplier/Installation Contractor shall aid District in utilizing the benefits of applicable Manufacturer's equipment warranties.
  - 3. The Supplier/Installation Contractor shall broker or process this equipment for repair or replacement (no additional charge) to the applicable manufacturer for the term established by the manufacturer on a depot basis only.

END OF SECTION



SECTION 28 46 00  
FIRE DETECTION AND ALARM

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. Fire alarm system design and installation, including all components, wiring, and conduit.
- B. Transmitters for communication with supervising station.
- C. Circuits from protected premises to supervising station, including conduit.
- D. Replacement and removal of existing fire alarm system components, wiring, and conduit indicated.
- E. Maintenance of fire alarm system under contract for specified warranty period.
- F. The fire alarm system shall consist of all necessary hardware equipment and software programming to perform the following functions:
  - 1. Fire alarm detection operations.
  - 2. Control and monitoring of elevators, smoke control equipment and other equipment as indicated in the drawings and specifications.
  - 3. System shall tie into the existing Gamewell FCI E3 panel and be fully integrated. New appliances shall be an extension to the existing FACU.
- G. Thoroughly inspect the existing system and site conditions before bid. Advise the District's Representative of all conditions requiring immediate attention or might cause difficulties that are not addressed, or inferred to, in the contract drawings and specifications prior to new construction and the commencement of the guarantee period.
- H. Review the Drawings and Specifications for work and material provided by others that will affect work specified under this Section. Carefully coordinate with other trades, equipment suppliers, contractors, etc. as required to provide a high quality reliable installation with a minimum of construction delays. All work required to be re-accomplished due to lack of coordination shall be done at the Contractor's expense.

1.02 RELATED REQUIREMENTS

- A. Firestopping: Materials and methods for work to be performed by this installer.
- B. Fire-Suppression Sprinkler Systems: Supervisory, alarm, and actuating devices installed in sprinkler system.
- C. Section 23 33 00 - Air Duct Accessories: Smoke dampers monitored and controlled by fire alarm system.
- D. REFERENCE STANDARDS
- E. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
  - 1. IEEE C62.41 - IEEE Recommended Practice on Surge Voltages in Low-Voltage Power Circuits; 1991 (R1995).
  - 2. California Electrical Code CEC; 2025 Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. NFPA 72 - National Fire Alarm and Signaling Code; Most Recent Edition Cited by Referring Code or Reference Standard.
- G. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. AMERICANS WITH DISABILITIES ACT (ADA)
  - 1. All visual Notification appliances and manual pull stations shall comply with the requirements of the Americans with Disabilities Act or 2025 CBC, whichever is more stringent.
- I. SUBMITTALS
  - 1. See Div 01 - Administrative Requirements, for submittal procedures.
  - 2. Proposal Documents: Submit the following with cost/time proposal:
    - a. NFPA 72 "Record of Completion", filled out to the extent known at the time.
    - b. Manufacturer's detailed data sheet for each control unit, initiating device, and notification appliance.
    - c. Certification by that the system design will comply with Contract Documents.
    - d. Proposed maintenance contract.

3. Drawings must be prepared using AutoCAD Release 2019.
  - a. Owner will provide floor plan drawings for 's use; verify all dimensions on Owner-provided drawings.
4. Evidence of designer qualifications.
5. Design Documents: Submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, riser diagrams, and description of operation:
  - a. Copy (if any) of list of data required by authority having jurisdiction.
  - b. NFPA 72 "Record of Completion", filled out to the extent known at the time.
  - c. Clear and concise description of operation, with input/output matrix similar to that shown in NFPA 72 Appendix A-14-6-1.1, and complete listing of software required.
  - d. System zone boundaries and interfaces to fire safety systems.
  - e. Location of all components, circuits, and raceways; mark components with identifiers used in control unit programming.
  - f. Circuit layouts; number, size, and type of raceways and conductors; conduit fill calculations; spare capacity calculations; notification appliance circuit voltage drop calculations.
  - g. List of all devices on each signaling line circuit, with spare capacity indicated.
  - h. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.
  - i. Description of power supplies; if secondary power is by battery include calculations demonstrating adequate battery power.
  - j. Certification by either the manufacturer of the control unit or by the manufacturer of each other component that the components are compatible with the control unit.
  - k. Certification by the manufacturer of the control unit that the system design complies with Contract Documents.
  - l. Certification by that the system design complies with Contract Documents.
  - m. Do not show existing components to be removed.

6. Evidence of installer qualifications.
7. Evidence of instructor qualifications; training lesson plan outline.
8. Evidence of maintenance contractor qualifications, if different from installer.
9. Inspection and Test Reports:
  - a. Submit inspection and test plan prior to closeout demonstration.
  - b. Submit documentation of satisfactory inspections and tests.
  - c. Submit NFPA 72 "Inspection and Test Form," filled out.
10. Operating and Maintenance Data: See Div 01 for additional requirements; revise and resubmit until acceptable; have one set available during closeout demonstration:
  - a. Complete set of specified design documents, as approved by authority having jurisdiction.
  - b. Additional printed set of project record documents and closeout documents, bound or filed in same manuals.
  - c. Contact information for firm that will be providing contract maintenance and trouble call-back service.
  - d. List of recommended spare parts, tools, and instruments for testing.
  - e. Replacement parts list with current prices, and source of supply.
  - f. Detailed troubleshooting guide and large scale input/output matrix.
  - g. Preventive maintenance, inspection, and testing schedule complying with NFPA 72; provide printed copy and computer format acceptable to Owner.
  - h. Detailed but easy to read explanation of procedures to be taken by non-technical administrative personnel in the event of system trouble, when routine testing is being conducted, for fire drills, and when entering into contracts for remodeling.
11. Project Record Documents: See Div 01 for additional requirements; have one set available during closeout demonstration:
  - a. Complete set of floor plans showing actual installed locations of components, conduit, and zones.

- b. "As installed" wiring and schematic diagrams, with final terminal identifications.
- c. "As programmed" operating sequences, including control events by device, updated input/output chart, and voice messages by event.

12. Closeout Documents:

- a. Certification by manufacturer that the system has been installed in compliance with manufacturer's installation requirements, is complete, and is in satisfactory operating condition.
- b. NFPA 72 "Record of Completion", filled out completely and signed by installer and authorized representative of authority having jurisdiction.
- c. Certificate of Occupancy.
- d. Maintenance contract.
- e. Report on training results.

13. Maintenance Materials, Tools, and Software: Furnish the following for Owner's use in maintenance of project.

- a. See Div 01 - Product Requirements, for additional provisions.
- b. Furnish spare parts of same manufacturer and model as those installed; deliver in original packaging, labeled in same manner as in operating and maintenance data and place in spare parts cabinet.
- c. In addition to the items in quantities indicated in PART 2, furnish the following:
  - 1) All tools, software, and documentation necessary to modify the fire alarm system using Owner's personnel; minimum modification capability to include addition and deletion of devices, circuits, and zones, and changes to system description, operation, and evacuation and instructional messages.
  - 2) One copy, of all software not resident in read-only-memory.

J. QUALITY ASSURANCE

- 1. Copies of Design Criteria Documents: Maintain at the project site for the duration of the project, bound together, an original copy of NFPA 72, the

relevant portions of applicable codes, and instructions and guidelines of authorities having jurisdiction; deliver to Owner upon completion.

2. Designer Qualifications: NICET Level III or IV (3 or 4) certified fire alarm technician or registered fire protection engineer, employed by fire alarm control panel manufacturer, , or installer , with experience designing fire alarm systems in the jurisdictional area of the authorities having jurisdiction
3. Installer Qualifications: Firm with minimum 3 years documented experience installing fire alarm systems of the specified type and providing contract maintenance service as a regular part of their business.
  - a. Authorized representative of control unit manufacturer; submit manufacturer's certification that installer is authorized; include name and title of manufacturer's representative making certification.
  - b. Installer Personnel: At least 2 years of experience installing fire alarm systems.
  - c. Supervisor: NICET level III or IV (3 or 4) certified fire alarm technician; furnish name and address.
  - d. Contract maintenance office located within 100 miles of project site.
  - e. Certified in California as fire alarm installer.
4. Maintenance Contractor Qualifications: Same entity as installer.
5. Instructor Qualifications: Experienced in technical instruction, understanding fire alarm theory, and able to provide the required training; trained by fire alarm control unit manufacturer.
6. WARRANTY
  - a. See Div 01 - Closeout Submittals, for additional warranty requirements.
  - b. Provide control panel manufacturer's warranty that system components other than wire and conduit are free from defects and will remain so for 1 year after date of Substantial Completion.
  - c. Provide installer's warranty that the installation is free from defects and will remain so for 1 year after date of Substantial Completion.

## **PART 2 PRODUCTS**

## **2.01 MANUFACTURERS (MATCH CAMPUS EXISTING SYSTEM)**

- A. Fire Alarm Control Units - Basis of Design: Honeywell Security & Fire Solutions/Gamewell-FCI ; \_\_\_\_\_ : www.gamewell-fci.com. No known equal.
- B. Existing Gamewell FCI E3 fire alarm control unit shall accommodate the new appliances. This integration shall result in a fully functional and integrated system as described in the plans and specifications.
- C. Fire Alarm Control Units and Accessories:
  - 1. Honeywell Security & Fire Solutions/Gamewell-FCI; \_\_\_\_\_: www.gamewell-fci.com/#sle.
  - 2. Provide control units made by the same manufacturer.
- D. Initiating Devices and Notification Appliances:
  - 1. Honeywell Security & Fire Solutions/Gamewell-FCI; \_\_\_\_\_: www.gamewell-fci.com/#sle.
  - 2. Same manufacturer as control units.
- E. Substitutions: See Div 01 - Product Requirements.
  - 1. For substitution of products by manufacturers not listed, submit product data showing features and certification by that the design will comply with Contract Documents.

## **2.02 FIRE ALARM SYSTEM**

- A. Fire Alarm System: Provide modifications and extensions to the existing automatic fire detection and alarm system:
  - 1. Provide all components necessary, regardless of whether shown in Contract Documents or not.
  - 2. Protected Premises: Entire building shown on drawings.
  - 3. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:
    - a. ADA Standards.
    - b. The requirements of the State Fire Marshal.

- c. The requirements of the local authority having jurisdiction , which is Division of State Architects.
    - d. Applicable local codes.
    - e. Contract Documents (drawings and specifications).
    - f. NFPA 101.
    - g. NFPA 72; where the word "should" is used consider that provision mandatory; where conflicts between requirements require deviation from NFPA 72, identify deviations clearly on design documents.
  - 4. Evacuation Alarm: Multiple smoke zones; allow for evacuation notification of any individual zone or combination of zones, in addition to general evacuation of entire premises.
  - 5. Voice Notification: Provide emergency voice/alarm communications with multichannel capability; digital.
  - 6. General Evacuation Zones: Each smoke zone is considered a general evacuation zone unless otherwise indicated, with alarm notification in all zones on the same floor, on the floor above, and the floor below.
  - 7. Program notification zones as directed by Owner.
  - 8. Hearing Impaired Occupants: Provide visible notification devices in all public areas and in dwelling units.
  - 9. Fire Command Center: Location indicated on drawings.
  - 10. Fire Alarm Control Unit: Existing, located at fire command center.
  - 11. Combined Systems: Do not combine fire alarm system with other non-fire systems.
- B. Supervising Stations and Fire Department Connections:
- 1. Public Fire Department Notification: By on-premises supervising station.
  - 2. Remote Supervising Station: UL-listed central station under contract to facility.
  - 3. Means of Transmission to Remote Supervising Station: Digital alarm communicator transmitter (DACT), 2 telephone lines.
- C. Circuits:

1. Initiating Device Circuits (IDC): Class B, Style A.
2. Signaling Line Circuits (SLC) Within Single Building: Class B, Style 0.5.
3. Notification Appliance Circuits (NAC): Class B, Style W.

D. Spare Capacity:

1. Initiating Device Circuits: Minimum 25 percent spare capacity.
2. Notification Appliance Circuits: Minimum 25 percent spare capacity.
3. Speaker Amplifiers: Minimum 25 percent spare capacity.
4. Fire Alarm Control Units: Capable of handling all circuits utilized to capacity without requiring additional components other than plug-in control modules.

E. Power Sources:

1. Primary: Dedicated branch circuits of the facility power distribution system.
2. Secondary: Storage batteries.
3. Capacity: Sufficient to operate entire system for period specified by NFPA 72.
4. Each Computer System: Provide uninterruptible power supply (UPS).

## 2.03 EXISTING COMPONENTS

- A. Existing Fire Alarm System: Remove existing components indicated and incorporate remaining components into new system, under warranty as if they were new; do not take existing portions of system out of service until new portions are fully operational, tested, and connected to existing system.
- B. Clearly label components that are "Not In Service."
- C. Remove unused existing components and materials from site and dispose of properly.

## 3.01 FIRE SAFETY SYSTEMS INTERFACES

- A. Supervision: Provide supervisory signals in accordance with NFPA 72 for the following:
  1. Sprinkler water control valves.
- B. Alarm: Provide alarm initiation in accordance with NFPA 72 for the following:

1. Sprinkler water flow.
2. Duct smoke detectors.

C. HVAC:

1. Duct Smoke Detectors: Close dampers indicated; shut down air handlers indicated.

2.04 COMPONENTS

A. General:

1. Provide flush mounted units where installed in finish areas; in unfinished areas, surface mounted unit are acceptable.
2. Provide legible, permanent labels for each control device, using identification used in operation and maintenance data.

B. Fire Alarm Control Units: Analog, addressable type; listed, classified, and labeled as suitable for the purpose intended.

C. Master Control Unit: As specified for Basis of Design above, or equivalent.

D. Addressable Modules:

1. Provide addressable modules suitable for connection to fire alarm control unit signaling line circuits.
2. Unless otherwise indicated, use addressable modules only in clean, dry, indoor, nonhazardous locations.
3. Monitor Modules: Unless devices are explicitly permitted to be connected together as zone, provide separate addressable monitor module for each conventional dry-contact input device in order to be individually identifiable by addressable fire alarm control unit.

E. Initiating Devices:

1. Addressable Manual Pull Stations: Existing to remain.
2. Smoke Detectors: Existing to remain.
3. Duct Smoke Detectors: Existing to remain
4. Heat Detectors: Existing to remain.

F. Notification Appliances:

1. Strobes: Wheelock ELSTR.
  - a. Provide 1 extra.
2. Strobes/Speaker: Wheelock ELSPSTR.
  - a. Provide 1 extra.
3. Notification Appliance Circuit provides synchronization of strobes at a rate of 1Hz and operates horns with a Temporal Code Pattern operation. The circuit shall provide the capability to silence the audible signals, while the strobes continue to flash, over a single pair of wires. The capability to synchronize multiple notification appliance circuits shall be provided.

G. The internal power supply & battery charger shall be capable of charging up 12.7 Ah batteries internally mounted or 18Ah batteries mounted in an external cabinet.

H. Emergency Power Supply:

1. General: Components include battery, charger, and an automatic transfer switch.
2. Battery: Sealed lead-acid or nickel cadmium type. Provide sufficient capacity to operate the complete alarm system in normal or supervisory (non-alarm) mode for a period of 24 hours. Following this period of operation on battery power, the battery shall have sufficient capacity to operate all components of the system, including all alarm indicating devices in alarm or supervisory mode for a period of 5 minutes.

I. Accessories: The contractor shall furnish the necessary accessories

J. Circuit Conductors: Copper; provide 200 feet extra; color code and label.

K. Locks and Keys: Deliver keys to Owner.

1. Provide the same standard lock and key for each key operated switch and lockable panel and cabinet; provide 5 keys of each type

L. Instruction Charts: Printed instruction chart for operators, showing steps to be taken when a signal is received (normal, alarm, supervisory, and trouble); easily readable from normal operator's station.

1. Frame: Stainless steel or aluminum with polycarbonate or glass cover.

2. Provide one for each control unit where operations are to be performed.
  3. Obtain approval of Owner prior to mounting; mount in location acceptable to Owner.
  4. Provide extra copy with operation and maintenance data submittal.
- M. Storage Cabinet for Spare Parts and Tools: Steel with baked enamel finish, size appropriate to quantity of parts and tools.
1. Padlock eye and hasp for lock furnished by Owner.
  2. Locate as directed by Owner.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Install in accordance with applicable codes, NFPA 72, CEC 2025, and the contract documents.
- B. Installation personnel shall be supervised by persons who are qualified and experienced in the installation, inspection, and testing of fire alarm systems. Examples of qualified personnel shall include, but not be limited to, the following:
  1. Factory trained and certified personnel.
  2. National Institute of Certification in Engineering Technologies (NICET) fire alarm level II certified personnel.
  3. Personnel licensed or certified by state or local authority.
- C. Conceal all wiring, conduit, boxes, and supports where installed in finished areas
- D. Install all wiring in conduit, 3/4" minimum. No exception.
- E. Existing Fire Alarm Equipment shall be maintained, and new control equipment and devices shall be 100% compatible with the existing system.
- F. Water-Flow and Valve Supervisory Switches: Connect for each sprinkler valve required to be supervised.
- G. Install instruction cards and labels.

#### **3.02 CLEANING AND ADJUSTING**

- A. Cleaning: Remove paint splatters and other spots, dirt, and debris. Clean unit internally using methods and materials recommended by manufacturer.
- B. Occupancy Adjustments: When requested within one year of date of Substantial Completion, provide on-site assistance in adjusting sound levels and adjusting controls and sensitivities to suit actual occupied conditions. Provide up to three visits to the site for this purpose.

### 3.03 INSPECTION AND TESTING FOR COMPLETION

- A. Notify Owner 7 days prior to beginning completion inspections and tests.
- B. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.
- C. Provide the services of the installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.
- D. Prepare for testing by ensuring that all work is complete and correct; perform preliminary tests as required.
- E. Provide all tools, software, and supplies required to accomplish inspection and testing.
- F. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.
- G. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.
- H. Diagnostic Period: After successful completion of inspections and tests, Operate system in normal mode for at least 14 days without any system or equipment malfunctions.
  - 1. Record all system operations and malfunctions.
  - 2. If a malfunction occurs, start diagnostic period over after correction of malfunction.
  - 3. Owner will provide attendant operator personnel during diagnostic period; schedule training to allow Owner personnel to perform normal duties.
  - 4. At end of successful diagnostic period, fill out and submit NFPA 72 "Inspection and Testing Form."

### 3.04 OWNER PERSONNEL INSTRUCTION

- A. Provide the following instruction to designated Owner personnel:
  - 1. Hands-On Instruction: On-site, using operational system.
  - 2. Classroom Instruction: Owner furnished classroom, on-site or at other local facility.
  - 3. Factory Instruction: At control unit manufacturer's training facility.
- B. Basic Operation: One-hour sessions for attendant personnel, security officers, and engineering staff; combination of classroom and hands-on:
  - 1. Initial Training: 1 session pre-closeout.
- C. Detailed Operation: Two-hour sessions for engineering staff; assume NICET level I qualifications or equivalent; combination of classroom and hands-on:
  - 1. Initial Training: 1 session pre-closeout.
- D. Maintenance Technicians: Detailed training for electrical technicians, on programming, maintaining, repairing, and modifying; factory training:
  - 1. Initial Training: One 3-day session, pre-closeout.
- E. Furnish the services of instructors and teaching aids; have copies of operation and maintenance data available during instruction.
- F. Provide means of evaluation of trainees suitable to type of training given; report results to Owner.

### 3.05 CLOSEOUT

- A. Closeout Demonstration: Demonstrate proper operation of all functions to Owner.
  - 1. Be prepared to conduct any of the required tests.
  - 2. Have at least one copy of operation and maintenance data, preliminary copy of project record drawings, input/output matrix, and operator instruction chart(s) available during demonstration.
  - 3. Have authorized technical representative of control unit manufacturer present during demonstration.

4. Demonstration may be combined with inspection and testing required by authority having jurisdiction; notify authority having jurisdiction in time to schedule demonstration.
5. Repeat demonstration until successful.

### 3.06 MAINTENANCE

- A. See Div 01 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.
- B. Provide to Owner, at no extra cost, a written maintenance contract for entire manufacturer's warranty period, to include the work described below.
- C. Perform routine inspection, testing, and preventive maintenance required by NFPA 72, including:
  1. Maintenance of fire safety interface and supervisory devices connected to fire alarm system.
  2. Repairs required, unless due to improper use, accidents, or negligence beyond the control of the maintenance contractor.
  3. Record keeping required by NFPA 72 and authorities having jurisdiction.
- D. Provide trouble call-back service upon notification by Owner:
  1. Provide on-site response within 24 hours of notification.
  2. Include allowance for call-back service during normal working hours at no extra cost to Owner.
  3. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.
- E. Provide a complete description of preventive maintenance, systematic examination, adjustment, cleaning, inspection, and testing, with a detailed schedule.
- F. Maintain a log at each fire alarm control unit, listing the date and time of each inspection and call-back visit, the condition of the system, nature of the trouble, correction performed, and parts replaced. Submit duplicate of each log entry to Owner's representative upon completion of site visit.

- G. Comply with Owner's requirements for access to facility and security.

END OF SECTION



ARCHITECTURE  
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