Rio Rancho Public Schools
ENTRY SECURITY MODIFICATIONS
Volume 2 of 2
Divisions 01 through 28

Mountain View Middle School
Project Number 083105-16-002

Rio Rancho Cyber Academy
Project Number 083018-16-001

Rio Rancho Middle School
Project Number 083016-16-001

Lincoln Middle School
Project Number 083481-16-001

Eagle Ridge Middle School
Project Number 083001-16-002

PROJECT MANUAL
June 15, 2016
Design Group Projects
3701 / 3702 / 3703 / 3704 / 3705
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      2. Work covered by Contract Documents.
      3. Work by Owner.
      4. Access to site.
      5. Coordination with occupants.
      6. Work restrictions.
      7. Specification and drawing conventions.
   B. Related Requirements:
      1. Section 01 50 00 "Temporary Facilities and Controls" for limitations and procedures
         governing temporary use of Owner's facilities.

1.2 PROJECT INFORMATION
   A. Project Identification: Entry Security Modifications
      1. Rio Rancho Public Schools Project 083105-16-002, Mountain View Middle School.
         a. Project Location: 4101 Montreal Loop NE, Rio Rancho, New Mexico 87144.
      2. Rio Rancho Public Schools Project 083818-16-001, Rio Rancho Cyber Academy.
         a. Project Location: 1330 Jackie Road SE, Rio Rancho, New Mexico 87124.
      3. Rio Rancho Public Schools Project 083016-16-001, Rio Rancho Middle School.
         a. Project Location: 1600 Loma Colorado Blvd NE, Rio Rancho, New Mexico 87144.
      4. Rio Rancho Public Schools Project 083481-16-001, Lincoln Middle School.
         a. Project Location: 2287 Lema Road NE, Rio Rancho, New Mexico 87124.
      5. Rio Rancho Public Schools Project 083001-16-002, Eagle Ridge Middle School.
         a. Project Location: 800 Fruta Road NE, Rio Rancho, New Mexico 87124.
B. Owner: Rio Rancho Public Schools.

1. Owner's Representative: Alfred Sena, Executive Director of Facilities, (575) 896-0667.

   Emily Brudenell, (505) 242-6880.

D. Architect's Consultants: The Architect has retained the following design professionals who have prepared designated portions of the Contract Documents:

1. Structural Engineer: Heatly Engineering.
   Scott Heatly, (505) 998-6496.

   Plumbing: Aaron Downing, (505) 883-4111.
   Mechanical: Ilir Mesiti, (505) 883-4111.

   Ilir Mesiti, (505) 883-4111.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:

1. Rio Rancho Public Schools Project 083105-16-002, Mountain View Middle School: The Work consists repairs and renovations at the entry and administration areas together with supporting mechanical and electrical systems. Work area is approximately 2,570 square feet.

2. Rio Rancho Public Schools Project 083818-16-001, Rio Rancho Cyber Academy: The Work consists repairs and renovations at the entry and administration areas together with supporting mechanical and electrical systems. Work area is approximately 785 square feet.

3. Rio Rancho Public Schools Project 083016-16-001, Rio Rancho Middle School: The Work consists repairs and renovations at the entry and administration areas together with supporting mechanical and electrical systems. Work area is approximately 1,860 square feet.

4. Rio Rancho Public Schools Project 083481-16-001, Lincoln Middle School: The Work consists repairs and renovations at the entry and administration areas together with supporting mechanical and electrical systems. Work area is approximately 990 square feet.

5. Rio Rancho Public Schools Project 083001-16-002, Eagle Ridge Middle School: The Work consists repairs and renovations at the entry and administration areas together with supporting mechanical and electrical systems. Work area is approximately 2,570 square feet.
B. Type of Contract:

1. Project will be constructed under individual single prime contracts for each Bid Lot.

1.4 WORK BY OWNER

A. General: Cooperate fully with Owner so work may be carried out smoothly, without interfering with or delaying work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.

1.5 ACCESS TO SITE

A. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.

B. Use of Site: Limit use of Project site to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Driveways, Walkways and Entrances: Keep driveways loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
   a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
   b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

1.6 COORDINATION WITH OCCUPANTS

A. Full Owner Occupancy: Owner will occupy site and existing building(s) during entire construction period. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits unless otherwise indicated.

1. 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 approval of authorities having jurisdiction.

2. Notify Owner not less than 72 hours in advance of activities that will affect Owner's operations.
1.7  WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.

B. On-Site Work Hours: Limit work in the existing building to normal business working hours of 6:00 a.m. to 6:00 p.m., Monday through Friday, unless otherwise indicated.

1. Weekend Hours: 6:00 a.m. to 6:00 p.m.
2. Early Morning Hours: Restrict noise levels to those allowed by authorities having jurisdiction.
3. Hours for Utility Shutdowns: as approved by Owner on a case by case basis.
4. Hours for Noise generating activity such as jack hammering or core drilling: As required by authorities having jurisdiction.

C. Existing Utility Interruptions: 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:

1. Notify Owner not less than two days in advance of proposed utility interruptions.
2. Obtain Owner's written permission before proceeding with utility interruptions.

D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.

1. Notify Owner not less than two days in advance of proposed disruptive operations.
2. Obtain Owner's written permission before proceeding with disruptive operations.

E. Nonsmoking Campus: Smoking is not permitted on Rio Rancho Public School property.

F. Employee Screening: Comply with Owner's requirements for drug and background screening of Contractor personnel working on Project site.

1. No Contractor personnel or Subcontractor personnel shall be allowed on school property prior to successful background clearance and acceptance for Rio Rancho Public Schools.
2. Maintain list of approved screened personnel with Owner's representative.

1.8  SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.
3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 10 00
SECTION 01 25 00
SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:
   1. Section 01 60 00 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.2 DEFINITIONS

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

   1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
   2. Substitutions for Convenience: Changes proposed by Contractor that offer no alternate benefit to the Owner.

1.3 ACTION SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

   2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
      a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
      b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
      c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific
features and requirements indicated. Indicate deviations, if any, from the Work specified.

d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.

e. Samples, where applicable or requested.

f. Certificates and qualification data, where applicable or requested.

g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.

h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.

i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.

j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.

k. Cost information, including a proposal of change, if any, in the Contract Sum.

l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.

m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor through Construction Manager of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.


b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.4 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.5 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.
PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

   a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
   b. Requested substitution provides sustainable design characteristics that specified product provided.
   c. Substitution request is fully documented and properly submitted.
   d. Requested substitution will not adversely affect Contractor's construction schedule.
   e. Requested substitution has received necessary approvals of authorities having jurisdiction.
   f. Requested substitution is compatible with other portions of the Work.
   g. Requested substitution has been coordinated with other portions of the Work.
   h. Requested substitution provides specified warranty.
   i. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Not allowed.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 25 00
SECTION 01 25 00.01

SUBSTITUTION REQUEST FORM

TO: The Hartman + Majewski Design Group  DATE: ________________
    120 Vassar Dr. SE Suite 100
    Albuquerque, NM 87106

FROM: ____________________________________________________________________________

RE: ________________________________________________________________________________

Specification Title: _________________________________________________________________
Section: ________________ Page: ________________ Article/Paragraph: ______________

Proposed Substitution:
Product: ___________________________________________ Model No. ______________
Manufacturer: ______________________________________________________________________
History:  ____ New Product  ____ 2-5 years old  ____ 5-10 years old  ____ 10 years old plus
Differences between proposed substitution and specified product:
_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________

___________  Point by point comparative data attached – REQUIRED BY CM AND A/E

Reason for not providing specified item:
_________________________________________________________________________________
_________________________________________________________________________________

List similar installations;  Project, Project Address, Architect, Owner, and date installed.
_________________________________________________________________________________
Savings to Owner for accepting substitution:

__________________________________________ ($______________)

Changes to contract time if proposed substitution is accepted:

___ No change  ___ Yes: Add / Deduct ___________________________ days.

Supporting information attached:

___ Product Data  ___ Drawings  ___ Samples  ___ Other: ________________

The undersigned certifies:

1. The proposed substitution has been fully investigated and determined to be equal or superior in all respects to the specified product.
2. The same warranty or superior will be furnished for the proposed substitution.
3. The same maintenance, service, and source of replacement parts, as applicable is available.
4. The proposed substitution will not affect or delay the Progress Schedule.
5. Cost data as stated above is complete. Claims for costs related to the accepted substitution which may subsequently become apparent are to be waived.
6. The proposed substitution does not affect dimensions or functional clearances.
7. Payment will be made for changes to building design, including architectural or engineering design, detailing, and construction costs caused by the requested substitution.
8. Coordination, installation, and changes to the Work made necessary by the accepted substitution will be complete in all respects.

Submitted by: __________________________________________________________

Firm: _________________________________________________________________

ARCHITECT’S AND CONSTRUCTION MANAGER’S REVIEW AND ACTION:

___ Substitution Approved – Make submittals in accordance with Division 1.

___ Substitution Approved as Noted – Make submittals in accordance with Division 1.

___ Substitution Rejected – Use specified product.

___ Substitution Request received too late – Use specified product.

By ___________________________________________ Date: ________________

END OF SECTION 01 25 00.01
SECTION 01 26 00
CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY
A. Section includes administrative and procedural requirements for handling and processing Contract modifications.
B. Related Requirements:
   1. Section 01 25 00 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.

1.2 MINOR CHANGES IN THE WORK
A. Architect will issue through Construction Manager supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions."

1.3 PROPOSAL REQUESTS
A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
   1. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
   2. Within time specified in Proposal Request or 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
      a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
      b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
      c. Include costs of labor and supervision directly attributable to the change.
      d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
      e. Quotation Form: Use forms acceptable to Architect.
B. Contractor-Initiated Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.

1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Section 01 25 00 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.

1.4 CHANGE ORDER PROCEDURES


1.5 CONSTRUCTION CHANGE DIRECTIVE


1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.
PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 26 00
SECTION 01 29 00
PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Requirements:
   1. Section 01 26 00 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
   2. Section 01 32 00 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.2 DEFINITIONS

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

1.3 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.

   1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:

      a. Application for Payment forms with continuation sheets.
      b. Items required to be indicated as separate activities in Contractor's construction schedule.

   2. Submit the schedule of values to Architect through Construction Manager at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.

   3. Subschedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values coordinated with each phase of payment.

   4. Subschedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide subschedules showing values coordinated with each element.
B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the schedule of values:
   a. Project name and location.
   b. Name of Architect.
   c. Architect's project number.
   d. Contractor's name and address.
   e. Date of submittal.

2. Arrange schedule of values consistent with format of AIA Document G703.
3. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:
   a. Related Specification Section or Division.
   b. Description of the Work.
   c. Name of subcontractor.
   d. Name of manufacturer or fabricator.
   e. Name of supplier.
   f. Change Orders (numbers) that affect value.
   g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

   1) Labor.
   2) Materials.
   3) Equipment.

   a. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.

5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
6. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
   a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.
Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.

8. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.4 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

1. Submit draft copy of Application for Payment seven days prior to due date for review by Architect.

C. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.

1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.
E. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.

1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
3. Provide summary documentation for stored materials indicating the following:
   a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
   b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
   c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

F. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit conditional final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
5. Waiver Forms: Submit executed waivers of lien on forms, acceptable to Owner.

H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of values.
3. Contractor's construction schedule (preliminary if not final).
4. Schedule of unit prices.
5. List of Contractor's staff assignments.
7. Copies of building permits.
11. Certificates of insurance and insurance policies.
13. Data needed to acquire Owner's insurance.

I. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

J. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
6. AIA Document G707, "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 29 00
PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General coordination procedures.
2. Requests for Information (RFIs).
3. Project meetings.

B. Related Requirements:

1. Section 01 32 00 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
2. Section 01 73 00 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
3. Section 01 77 00 "Closeout Procedures" for coordinating closeout of the Contract.

1.2 DEFINITIONS

A. RFI: Request from Owner, Construction Manager, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.3 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
1.4 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1.5 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of Architect and Construction Manager.
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

   a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.

1. Attachments shall be electronic files in Adobe Acrobat PDF format.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.

1. The following Contractor-generated RFIs will be returned without action:

   a. Requests for approval of submittals.
   b. Requests for approval of substitutions.
   c. Requests for approval of Contractor's means and methods.
   d. Requests for coordination information already indicated in the Contract Documents.
   e. Requests for adjustments in the Contract Time or the Contract Sum.
   f. Requests for interpretation of Architect's actions on submittals.
   g. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 01 26 00 "Contract Modification Procedures."

a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect and Construction Manager in writing within 10 days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit current log at each project meeting. Include the following:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect and Construction Manager.
4. RFI number including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect and Construction Manager within seven days if Contractor disagrees with response.

1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

1.6 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner, Construction Manager, and Architect, within three days of the meeting.

B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 10 calendar days after execution of the Agreement.

1. Conduct the conference to review responsibilities and personnel assignments.
2. Attendees: Authorized representatives of Owner, Construction Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect progress, including the following:
   a. Tentative construction schedule.
   b. Critical work sequencing and long-lead items.
   c. Designation of key personnel and their duties.
   d. Lines of communications.
   e. Procedures for processing field decisions and Change Orders.
   f. Procedures for RFI.
   g. Procedures for testing and inspecting.
   h. Procedures for processing Applications for Payment.
   i. Distribution of the Contract Documents.
   j. Submittal procedures.
   k. Preparation of record documents.
   l. Use of the premises and existing buildings.
   m. Work restrictions.
   n. Working hours.
   o. Owner's occupancy requirements.
   p. Responsibility for temporary facilities and controls.
   q. Procedures for moisture and mold control.
   r. Procedures for disruptions and shutdowns.
   s. Construction waste management and recycling.
   t. Parking availability.
   u. Office, work, and storage areas.
   v. Equipment deliveries and priorities.
   w. First aid.
   x. Security.
   y. Progress cleaning.

4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect, Construction Manager of scheduled meeting dates.

2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
   b. Options.
   c. Related RFIs.
   d. Related Change Orders.
   e. Purchases.
   f. Deliveries.
   g. Submittals.
   h. Review of mockups.
   i. Possible conflicts.
j. Compatibility requirements.
k. Time schedules.
l. Weather limitations.
m. Manufacturer's written instructions.
n. Warranty requirements.
o. Compatibility of materials.
p. Acceptability of substrates.
q. Temporary facilities and controls.
r. Space and access limitations.
s. Regulations of authorities having jurisdiction.
t. Testing and inspecting requirements.
u. Installation procedures.
v. Coordination with other work.
w. Required performance results.
x. Protection of adjacent work.
y. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 15 calendar days prior to the scheduled date of Substantial Completion.

1. Conduct the conference to review requirements and responsibilities related to Project closeout.
2. Attendees: Authorized representatives of Owner, Construction Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:

a. Preparation of record documents.
b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
c. Submittal of written warranties.
d. Requirements for preparing operations and maintenance data.
e. Requirements for delivery of material samples, attic stock, and spare parts.
f. Requirements for demonstration and training.
g. Preparation of Contractor's punch list.
h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
i. Submittal procedures.
j. Owner's partial occupancy requirements.
k. Installation of Owner's furniture, fixtures, and equipment.
l. Responsibility for removing temporary facilities and controls.

4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

E. Progress Meetings: Conduct progress meetings at weekly intervals.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner, Construction Manager, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

1) Review schedule for next period.

b. Review present and future needs of each entity present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Status of submittals.
4) Deliveries.
5) Off-site fabrication.
6) Access.
7) Site utilization.
8) Temporary facilities and controls.
9) Progress cleaning.
10) Quality and work standards.
11) Status of correction of deficient items.
12) Field observations.
13) Status of RFIs.
14) Status of proposal requests.
15) Pending changes.
16) Status of Change Orders.
17) Pending claims and disputes.
18) Documentation of information for payment requests.
4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 31 00
SECTION 01 32 00
CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Startup construction schedule.
2. Contractor's construction schedule.
3. Construction schedule updating reports.
4. Daily construction reports.
5. Material location reports.
6. Site condition reports.
7. Special reports.

B. Related Requirements:

1. Section 01 33 00 "Submittal Procedures" for submitting schedules and reports.
2. Section 01 40 00 "Quality Requirements" for submitting a schedule of tests and inspections.

1.2 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

1.3 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1. PDF electronic file.

B. Startup construction schedule.
C. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

D. Construction Schedule Updating Reports: Submit with Applications for Payment.

E. Daily Construction Reports: Submit at monthly intervals.

F. Material Location Reports: Submit at monthly intervals.

G. Site Condition Reports: Submit at time of discovery of differing conditions.

H. Special Reports: Submit at time of unusual event.

1.4 COORDINATION

A. Coordinate Contractor's construction schedule with the schedule of values, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.
2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Time Frame: Extend schedule from date established for commencement of the Work to date of final completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 30 days, unless specifically allowed by Architect.
2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule.
3. Submittal Review Time: Include review and resubmittal times indicated in Section 01 33 00 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
4. Startup and Testing Time: Include no fewer than 10 days for startup and testing.
5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's and Construction Manager's administrative procedures necessary for certification of Substantial Completion.
6. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
2. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Section 01 10 00 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
3. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 01 10 00 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
4. Work Restrictions: Show the effect of the following items on the schedule:
   a. Coordination with existing construction.
   b. Limitations of continued occupancies.
   c. Uninterruptible services.
   d. Partial occupancy before Substantial Completion.
   e. Use of premises restrictions.
   g. Seasonal variations.
   h. Environmental control.

5. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
   a. Subcontract awards.
   b. Submittals.
   c. Purchases.
   d. Mockups.
   e. Fabrication.
   f. Sample testing.
   g. Deliveries.
   h. Installation.
   i. Tests and inspections.
   j. Adjusting.
   k. Curing.
   l. Startup and placement into final use and operation.

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

E. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:

1. Unresolved issues.
2. Unanswered Requests for Information.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.

F. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.

2.2 STARTUP CONSTRUCTION SCHEDULE

A. Bar-Chart Schedule: Submit startup, horizontal, bar-chart-type construction schedule within seven days of date established for commencement of the Work.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

C. Differentiate Work in each building.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's construction schedule within 30 days of date established for commencement of the Work. Base schedule on the startup construction schedule and additional information received since the start of Project.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 25 percent increments within time bar.
2. Differentiate Work in each building.

2.4 REPORTS

A. Daily Construction Reports: Prepare a daily construction report, submit the report electronically to the Architect and the Rio Rancho Public Schools Project Manager by 10:00 A.M. the following work day, recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. Approximate count of personnel at Project site.
3. Equipment at Project site.
5. High and low temperatures and general weather conditions, including presence of rain or snow.
6. Accidents.
7. Meetings and significant decisions.
8. Unusual events (see special reports).
9. Stoppages, delays, shortages, and losses.
10. Meter readings and similar recordings.
11. Emergency procedures.
12. Orders and requests of authorities having jurisdiction.
13. Change Orders received and implemented.
14. Construction Change Directives received and implemented.
15. Services connected and disconnected.
16. Equipment or system tests and startups.
17. Partial completions and occupancies.
18. Substantial Completions authorized.

B. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. Indicate the following categories for stored materials:

1. Material stored prior to previous report and remaining in storage.
2. Material stored prior to previous report and since removed from storage and installed.
3. Material stored following previous report and remaining in storage.

C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.5 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.
PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before next regularly scheduled progress meeting and one week prior to submittal of monthly application for payment.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate final completion percentage for each activity.

B. Distribution: Distribute copies of approved schedule to Architect, Construction Manager, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 01 32 00
SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Requirements:

1. Section 01 25 00 “Substitution Procedures” for requirements for substituting items not specified in lieu of items specified.
2. Section 01 29 00 "Payment Procedures" for submitting Applications for Payment and the schedule of values.
3. Section 01 32 00 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
4. Section 01 60 00 “Product Requirements” for requirements for comparable products.
5. Section 01 78 23 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
6. Section 01 78 39 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
7. Section 01 79 00 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's and Construction Manager's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's and Construction Manager's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.

1.3 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings will not be provided by Architect for Contractor's use in preparing submittals.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
   a. Architect and Construction Manager reserve the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 15 days for review of each resubmittal.

D. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

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.
   a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).
3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Owner, 
containing the following information:

a. Project name.
b. Date.
c. Name and address of Architect.
d. Name of Construction Manager.
e. Name of Contractor.
f. Name of firm or entity that prepared submittal.
g. Names of subcontractor, manufacturer, and supplier.
h. Category and type of submittal.
i. Submittal purpose and description.
j. Specification Section number and title.
k. Specification paragraph number or drawing designation and generic name for each 
of multiple items.
l. Drawing number and detail references, as appropriate.
m. Location(s) where product is to be installed, as appropriate.
n. Related physical samples submitted directly.
o. Indication of full or partial submittal.
p. Transmittal number, numbered consecutively.
q. Submittal and transmittal distribution record.
r. Other necessary identification.
s. Remarks.

5. Metadata: Include the following information as keywords in the electronic submittal file 
metadata:

a. Project name.
b. Number and title of appropriate Specification Section.
c. Manufacturer name.
d. Product name.

E. Options: Identify options requiring selection by Architect.

F. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's 
letterhead, record relevant information, requests for data, revisions other than those requested 
by Architect on previous submittals, and deviations from requirements in the Contract 
Documents, including minor variations and limitations. Include same identification information 
as related submittal.

G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of 
revision.
3. Resubmit submittals until they are indicated approved, or approved as noted, by 
Architect.
PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. Submittals will not be accepted when Basis of Design products or Sole Source products are used.

B. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Submit electronic submittals via email as PDF electronic files.

2. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
   a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
   b. Provide a notarized statement on original paper copy certificates and certifications where indicated.

C. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:
   a. Manufacturer's catalog cuts.
   b. Manufacturer's product specifications.
   c. Standard color charts.
   d. Statement of compliance with specified referenced standards.
   e. Testing by recognized testing agency.
   f. Application of testing agency labels and seals.
g. Notation of coordination requirements.
h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:
   a. Wiring diagrams showing factory-installed wiring.
   b. Printed performance curves.
   c. Operational range diagrams.
   d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before or concurrent with Samples.
6. Submit Product Data in the following format:
   a. PDF electronic file.

D. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
   1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
      a. Identification of products.
      b. Schedules.
      c. Compliance with specified standards.
      d. Notation of coordination requirements.
      e. Notation of dimensions established by field measurement.
      f. Relationship and attachment to adjoining construction clearly indicated.
      g. Seal and signature of professional engineer if specified.
   2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 24 by 36 inches.
   3. Submit Shop Drawings in the following format:
      a. PDF electronic file.

E. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
   1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
   2. Identification: Attach label on unexposed side of Samples that includes the following:
      a. Generic description of Sample.
      b. Product name and name of manufacturer.
      c. Sample source.
      d. Number and title of applicable Specification Section.
      e. Specification paragraph number and generic name of each item.
3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.

4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
   a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
   b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
   a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
   a. Number of Samples: Submit three sets of Samples. Architect will retain one Sample set; remainder will be returned. Mark up and retain one returned Sample set as a project record sample.

   1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.

   2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of three units that show approximate midrange and limits of variations.

F. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
2. Manufacturer and product name, and model number if applicable.
3. Number and name of room or space.
4. Location within room or space.
Submit product schedule in the following format:

a. PDF electronic file.

G. Contractor's Construction Schedule: Comply with requirements specified in Section 01 32 00 "Construction Progress Documentation."

H. Application for Payment and Schedule of Values: Comply with requirements specified in Section 01 29 00 "Payment Procedures."

I. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 01 40 00 "Quality Requirements."

J. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 01 77 00 "Closeout Procedures."

K. Maintenance Data: Comply with requirements specified in Section 01 78 23 "Operation and Maintenance Data."

L. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

M. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.

N. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

O. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

P. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

Q. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

R. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

S. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
T. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.
5. Description of product.
6. Test procedures and results.
7. Limitations of use.

U. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

V. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

W. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

X. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Project Closeout and Maintenance Material Submittals: See requirements in Section 01 77 00 "Closeout Procedures."

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
3.2 ARCHITECT’S ACTION

A. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will indicate action, as follows:

1. APPROVED AS SUBMITTED: Item may be incorporated into the Work as submitted.

2. APPROVED AS NOTED: Submittal contains minor deviations. Item may be incorporated into the work, but only with corrections noted.

3. REVISE AND RESUBMIT: Submittal contains major deviations. Item may not be incorporated into the Work. Revise the submittal to correct deficiencies and resubmit.

4. REJECTED: Submittal does not meet specification. Item may not be incorporated into the Work. Provide item to meet specified requirements. Make submittal on item meeting specified requirements as noted in relevant specification section.

5. NO REVIEW REQUIRED: Submittal does not require review. Reasons include, but are not limited to, the following:
   a. Informational submittal not requiring review, refer to paragraph 3.2.B below.
   b. Submittal contains Substitution for Contractor’s Convenience, refer to Section 01 25 00, paragraph 2.1.B.
   c. Submittal contains Substitution for Cause without documentation, refer to Section 01 25 00, paragraph 2.1.A and Section 01 60 00, paragraph 2.2.

B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION 01 33 00
PART 1 - GENERAL

1.1 SUMMARY

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

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

1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.

2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.

3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, Construction Manager, or authorities having jurisdiction are not limited by provisions of this Section.

4. Specific test and inspection requirements are not specified in this Section.

1.2 DEFINITIONS

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

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

C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. Laboratory Mockups: Full-size physical assemblies constructed at testing facility to verify performance characteristics.
2. Integrated Exterior Mockups: Mockups of the exterior envelope erected separately from the building but on Project site, consisting of multiple products, assemblies, and subassemblies.

3. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes, doors, windows, millwork, casework, specialties, furnishings and equipment, and lighting.

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

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

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

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

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

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

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

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

1.3 CONFLICTING REQUIREMENTS

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

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

1.4 INFORMATIONAL SUBMITTALS

A. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:
   1. Seismic-force-resisting system, designated seismic system, or component listed in the designated seismic system quality-assurance plan prepared by Architect.

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

1.5 REPORTS AND DOCUMENTS

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

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:
   1. Name, address, and telephone number of technical representative making report.
   2. Statement on condition of substrates and their acceptability for installation of product.
   3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

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

1.6 QUALITY ASSURANCE

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

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

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

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

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.
F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

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

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

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

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

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect or Construction Manager.
2. Notify Architect and Construction Manager seven days in advance of dates and times when mockups will be constructed.
3. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction at Project.
4. Demonstrate the proposed range of aesthetic effects and workmanship.
5. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
   a. Allow seven days for initial review and each re-review of each mockup.
6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
7. Demolish and remove mockups when directed unless otherwise indicated.

K. Integrated Exterior Mockups: Construct integrated exterior mockup as indicated and where directed. Coordinate installation of exterior envelope materials and products for which mockups are required in individual Specification Sections, along with supporting materials.
L. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Specification Sections.

1.7 QUALITY CONTROL

A. Owner Responsibilities: Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.

B. Contractor Responsibilities: Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.

1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
   a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

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

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 01 33 00 "Submittal Procedures."

D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

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

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

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

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

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

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

1.8 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner will engage a qualified testing agency or special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

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

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

3.2 REPAIR AND PROTECTION

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

   1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 01 73 00 "Execution."

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

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

END OF SECTION 01 40 00
SECTION 01 42 00
REFERENCES

PART 1 - GENERAL

1.1 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.2 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.3 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."

B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

5. ACI - American Concrete Institute; (Formerly: ACI International); www.concrete.org.
6. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
17. ASSE - American Society of Safety Engineers (The); www.asse.org.
22. AWPA - American Wood Protection Association; (Formerly: American Wood-Preservers' Association); www.awpa.com.
28. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.com.
29. CDA - Copper Development Association; www.copper.org.
30. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
33. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
34. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
35. CSA - Canadian Standards Association; www.csa.ca.
36. CSI - Construction Specifications Institute (The); www.csinet.org.
37. CWC - Composite Wood Council; (See CPA).
39. DHI - Door and Hardware Institute; www.dhi.org.
40. ECA - Electronic Components Association; (See ECIA).
41. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
42. ECIA - Electronic Components Industry Association; www.eciaonline.org
43. EIA - Electronic Industries Alliance; (See TIA).
44. ESDJ - ESD Association; (Electrostatic Discharge Association); www.esda.org.
46. GA - Gypsum Association; www.gypsum.org.
49. GI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
50. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
54. IAS - International Accreditation Service; www.iasonline.org.
55. IAS - International Approval Services; (See CSA).
56. ICBO - International Conference of Building Officials; (See ICC).
58. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
59. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
60. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
62. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
63. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
64. IESNA - Illuminating Engineering Society of North America; (See IES).
65. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
67. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
68. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
70. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
72. LMA - Laminating Materials Association; (See CPA).
73. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
74. MMPA - Moulding & Millwork Producers Association; (Formerly: Wood Moulding & Millwork Producers Association); www.wmmpa.com.
77. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
78. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
82. NECA - National Electrical Contractors Association; www.necanet.org.
84. NEMA - National Electrical Manufacturers Association; www.nema.org.
85. NETA - InterNational Electrical Testing Association; www.netaworld.org.
86. NFHS - National Federation of State High School Associations; www.nfhs.org.
88. NFPA - NFPA International; (See NFPA).
91. NLGA - National Lumber Grades Authority; www.nlga.org.
94. NSF - NSF International; (National Sanitation Foundation International); www.nsf.org.
95. NSPE - National Society of Professional Engineers; www.nspe.org.
96. PDI - Plumbing & Drainage Institute; www.pdionline.org.
99. SAE - SAE International; (Society of Automotive Engineers); www.sae.org.
100. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
101. SDI - Steel Door Institute; www.steeldoor.org.
103. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
108. TIA - Telecommunications Industry Association; (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
109. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
110. UBC - Uniform Building Code; (See ICC).
112. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
113. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
115. WMMPA - Wood Moulding & Millwork Producers Association; (See MMPA).

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.

1. DIN - Deutsches Institut für Normung e.V.; www.din.de.
2. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up-to-date as of the date of the Contract Documents.

1. COE - Army Corps of Engineers; www.usace.army.mil.
3. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
5. DOE - Department of Energy; www.energy.gov.
6. EPA - Environmental Protection Agency; www.epa.gov.
7. FAA - Federal Aviation Administration; www.faa.gov.
11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; http://eetd.lbl.gov.
12. OSHA - Occupational Safety & Health Administration; www.osha.gov.
13. SD - Department of State; www.state.gov.
15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
16. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
17. USDJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

2. DOD - Department of Defense; Military Specifications and Standards; Available from Department of Defense Single Stock Point; http://dodssp.daps.dla.mil.
3. DSCC - Defense Supply Center Columbus; (See FS).
4. FED-STD - Federal Standard; (See FS).
6. MILSPEC - Military Specification and Standards; (See DOD).
7. USAB - United States Access Board; www.access-board.gov.
8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).

F. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CID; Construction Industries Division of the New Mexico Regulation & Licensing Department; www.rld.state.nm.us/construction/.
2. PSFA or NMPSFA; New Mexico Public School Facilities Authority; www.nmpsfa.org.
3. NMDOT; New Mexico Department of Transportation; www.dot.state.nm.us.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 42 00
SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY
A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
B. Related Requirements:
   1. Section 01 10 00 "Summary" for work restrictions and limitations on utility interruptions.

1.2 USE CHARGES
A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, testing agencies, and authorities having jurisdiction.
B. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
C. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.3 QUALITY ASSURANCE
A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
1.4 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Polyethylene Sheet: Reinforced, fire-resistant sheet, 10-mil minimum thickness, with flame-spread rating of 15 or less per ASTM E 84 and passing NFPA 701 Test Method 2.

B. Dust-Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches.

2.2 TEMPORARY FACILITIES

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
   1. Store combustible materials apart from building.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
   1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
   2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.
   3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section 01 77 00 "Closeout Procedures".

C. Air-Filtration Units: Primary and secondary HEPA-filter-equipped portable units with four-stage filtration. Provide single switch for emergency shutoff. Configure to run continuously.
PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

1. Coordinate location with Owner.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

C. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

1. Toilets: Use of Owner's existing toilet facilities will not be permitted.

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

F. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.

1. Prior to commencing work, isolate the HVAC system in area where work is to be performed according to coordination drawings.

   a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.

   b. Maintain negative air pressure within work area using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.
2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.

3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

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

H. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.

I. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

J. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel.

1. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.

2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.

2. Maintain access for fire-fighting equipment and access to fire hydrants.

3. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.

4. Remove snow and ice as required to minimize accumulations.
C. Project Signs: Unauthorized signs are not permitted.
   1. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
      a. Provide temporary, directional signs for construction personnel and visitors.
   2. Maintain and touchup signs so they are legible at all times.

D. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 01 73 00 "Execution."

E. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
   1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
   1. Comply with work restrictions specified in Section 01 10 00 "Summary."

C. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

D. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

E. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.

F. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

G. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.
H. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

   1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.

I. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner from fumes and noise.

   1. Construct dustproof partitions with two layers of 6-mil polyethylene sheet on each side. Cover floor with two layers of 6-mil polyethylene sheet, extending sheets 18 inches up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant-treated plywood.

   2. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.

   3. Insulate partitions to control noise transmission to occupied areas.

   4. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.

   5. Protect air-handling equipment.

   6. Provide walk-off mats at each entrance through temporary partition.

J. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.

   1. Prohibit smoking in construction areas.

   2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.

   3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

3.5 MOISTURE AND MOLD CONTROL

A. Moisture-Protection: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.

B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:

   1. Protect porous materials from water damage.

   2. Protect stored and installed material from flowing or standing water.

   3. Keep porous and organic materials from coming into prolonged contact with concrete.

   4. Remove standing water from decks.

   5. Keep deck openings covered or dammed.
C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
2. Keep interior spaces reasonably clean and protected from water damage.
3. Periodically collect and remove waste containing cellulose or other organic matter.
4. Discard or replace water-damaged material.
5. Do not install material that is wet.
6. Discard, replace, or clean stored or installed material that begins to grow mold.
7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Use permanent HVAC system to control humidity.
3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
   a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective.
   b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
   c. Remove materials that cannot be completely restored to their manufactured moisture level within 48 hours.

3.6 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been
delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor.
2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 01 77 00 "Closeout Procedures."

END OF SECTION 01 50 00
SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

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

B. Related Requirements:
   1. Section 01 25 00 "Substitution Procedures" for requests for substitutions.
   2. Section 01 42 00 "References" for applicable industry standards for products specified.

1.2 DEFINITIONS

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

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.

2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.

3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," 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 additional manufacturers named in the specification.
1.3 ACTION SUBMITTALS

A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

   a. Form of Approval: As specified in Section 01 33 00 "Submittal Procedures."
   b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 01 33 00 "Submittal Procedures." Show compliance with requirements.

1.4 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

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

B. Delivery and Handling:

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

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

1.6 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 01 77 00 "Closeout Procedures."
PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.

2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.

3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

4. Where products are accompanied by the term "as selected," Architect will make selection.


6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.

B. Product Selection Procedures:

1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

3. Products:

   a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

   b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.

4. Manufacturers:

   a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with
requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.

5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 01 25 00 "Substitution Procedures" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.
6. Substitution for convenience not allowed.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 60 00
SECTION 01 73 00

EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Installation of the Work.
2. Cutting and patching.
3. Coordination of Owner-installed products.
4. Progress cleaning.
5. Starting and adjusting.
6. Protection of installed construction.

B. Related Requirements:

1. Section 01 10 00 "Summary" for limits on use of Project site.
2. Section 01 33 00 "Submittal Procedures" for submitting surveys.
3. Section 01 77 00 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
4. Section 02 41 19 "Selective Demolition" for demolition and removal of selected portions of the building.
5. Section 07 84 13 "Penetration Firestopping" for patching penetrations in fire-rated construction.

1.2 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.3 INFORMATIONAL SUBMITTALS

A. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:

1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.

3. Products: List products to be used for patching and firms or entities that will perform patching work.

4. Dates: Indicate when cutting and patching will be performed.

5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
   
   a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.

1.4 QUALITY ASSURANCE

A. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.

2. 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 that results in increased maintenance or decreased operational life or safety.

3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

B. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

C. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.
PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

   1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, and other construction affecting the Work.

   1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.

   2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

   1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.

   2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.

   3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.
3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 01 31 00 "Project Management and Coordination."

3.3 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that
adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.4 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

C. Temporary Support: Provide temporary support of work to be cut.

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 01 10 00 "Summary."

F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.
G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.

3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.

4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting andpatching operations.

5. 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.

6. Proceed with patching after construction operations requiring cutting are complete.

H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.

2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.

   a. Clean piping, conduit, and similar features before applying paint or other finishing materials.

   b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

   a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.

5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.5 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to Project site for Owner's construction personnel.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.

1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.

2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.6 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.


2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.

3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

   a. Use containers intended for holding waste materials of type to be stored.

4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.

2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials
specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 01 74 19 "Construction Waste Management and Disposal."

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

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

3.7 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: Comply with qualification requirements in Section 01 40 00 "Quality Requirements."

3.8 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 01 73 00
SECTION 01 77 00
CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.
5. Repair of the Work.

B. Related Requirements:

1. Section 01 73 00 "Execution" for progress cleaning of Project site.
2. Section 01 78 39 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.2 ACTION SUBMITTALS

A. Product Data: For cleaning agents.

B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.3 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.
1.5 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Owner. Label with manufacturer's name and model number where applicable.
   a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Construction Manager's signature for receipt of submittals.
5. Submit test/adjust/balance records.
6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Advise Owner of changeover in heat and other utilities.
6. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
7. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
8. Complete final cleaning requirements, including touchup painting.
9. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.6 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Section 01 29 00 "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.7 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:
   a. Project name.
   b. Date.
3. Name of Architect and Construction Manager.
4. Name of Contractor.
5. Page number.

4. Submit list of incomplete items in the following format:

1.8 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.

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

C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
   1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
   2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
   3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
   4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

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

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

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

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
   a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
   b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
   c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
   d. Remove tools, construction equipment, machinery, and surplus material from Project site.
   e. Remove snow and ice to provide safe access to building.
   f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
   g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
   h. Sweep concrete floors broom clean in unoccupied spaces.
   i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
   j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
   k. Remove labels that are not permanent.
   l. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
   m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
   n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
   o. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.

   p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
   q. Leave Project clean and ready for occupancy.

C. Construction Waste Disposal: Comply with waste disposal requirements in Section 01 74 19 "Construction Waste Management and Disposal."

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

   1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
   2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.

      a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.

   3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
   4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 01 77 00
PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:
   1. Record Drawings.
   2. Record Specifications.

B. Related Requirements:
   1. Section 01 73 00 "Execution" for final property survey.
   2. Section 01 77 00 "Closeout Procedures" for general closeout procedures.
   3. Section 01 78 23 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.2 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:
   1. Number of Copies: Submit one set(s) of marked-up record prints.
   2. Number of Copies: Submit copies of record Drawings as follows:
      a. Initial Submittal:
         1) Submit one paper-copy set(s) of marked-up record prints.
         2) Submit PDF electronic files of scanned record prints.
         3) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
      b. Final Submittal:
         1) Submit one paper-copy set(s) of marked-up record prints.
         2) Submit PDF electronic files of scanned record prints and one set(s) of prints.
         3) Print each drawing, whether or not changes and additional information were recorded.

B. Record Specifications: Submit one annotated paper copy and annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.
PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
   
   a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
   b. Accurately record information in an acceptable drawing technique.
   c. Record data as soon as possible after obtaining it.
   d. Record and check the markup before enclosing concealed installations.
   e. Cross-reference record prints to corresponding archive photographic documentation.

2. Content: Types of items requiring marking include, but are not limited to, the following:

   a. Dimensional changes to Drawings.
   b. Revisions to details shown on Drawings.
   c. Revisions to routing of piping and conduits.
   d. Revisions to electrical circuitry.
   e. Actual equipment locations.
   f. Duct size and routing.
   g. Locations of concealed internal utilities.
   h. Changes made by Change Order or Construction Change Directive.
   i. Changes made following Architect's written orders.
   j. Details not on the original Contract Drawings.
   k. Field records for variable and concealed conditions.
   l. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.

4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.

5. Mark important additional information that was either shown schematically or omitted from original Drawings.

6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect and Construction Manager. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:

2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
3. Refer instances of uncertainty to Architect for resolution.

C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification: As follows:
   a. Project name.
   b. Date.
   c. Designation "PROJECT RECORD DRAWINGS."
   d. Name of Architect and Construction Manager.
   e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

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

B. Format: Submit record Specifications as scanned PDF electronic file(s) of marked-up paper copy of Specifications.
3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's and Construction Manager's reference during normal working hours.

END OF SECTION 01 78 39
PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.
3. Salvage of existing items to be reused or recycled.

B. Related Requirements:

1. Section 01 10 00 "Summary" for restrictions on the use of the premises, Owner-occupancy requirements, and phasing requirements.
2. Section 01 73 00 "Execution" for cutting and patching procedures.

1.2 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.

C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.3 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.
1.4 PREINSTALLATION MEETINGS

A. Predemolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.
6. Proposed Protection Measures: Indicate the measures proposed for protecting individuals and property, for dust control and, for noise control. Indicate proposed locations and construction of barriers.

1.5 INFORMATIONAL SUBMITTALS

A. Warranties: Documentation indicated that existing warranties are still in effect after completion of selective demolition.

1.6 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
1.7 WARRANTY

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

B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Review record documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in record documents.

C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

E. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.

1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

F. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or preconstruction videotapes.
3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

1. Comply with requirements for existing services/systems interruptions specified in Section 01 10 00 "Summary."

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Arrange to shut off indicated utilities with utility companies.
2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
3. Disconnect, demolish, and remove plumbing, and HVAC systems, equipment, and components indicated to be removed.
   a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
   b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
   c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
   d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
   e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
   f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
   g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.

3.3 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Comply with requirements for access and protection specified in Section 01 50 00 "Temporary Facilities and Controls."

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 01 50 00 "Temporary Facilities and Controls."

C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

3.4 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

B. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items:
   1. Clean and repair items to functional condition adequate for intended reuse.
   2. Pack or crate items after cleaning and repairing. Identify contents of containers.
   3. Protect items from damage during transport and storage.
   4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

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

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings."

B. Roofing: Remove no more existing roofing than can be patched in the same day so that building interior remains watertight and weathertight.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
   1. Do not allow demolished materials to accumulate on-site.
   2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
   3. Comply with requirements specified in Section 01 74 19 "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.
3.7 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 02 41 19
SECTION 05 50 00

METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Steel framing and supports for mechanical and electrical equipment.
   2. Steel framing and supports for applications where framing and supports are not specified in other Sections.

B. Products furnished, but not installed, under this Section include the following:
   1. Loose steel lintels.
   2. Anchor bolts and steel pipe sleeves, indicated to be cast into concrete or built into unit masonry.
   3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

C. Related Requirements:
   1. Section 03 30 00 "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.
   2. Section 04 26 13 "Masonry Veneer" for installing loose lintels and other items built into unit masonry.
   3. Section 05 12 00 "Structural Steel Framing."

1.2 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.3 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
1.4 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.

D. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.

E. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.

2. Material: Cold-rolled steel, ASTM A 1008/A 1008M, commercial steel, Type B or structural steel, Grade 33; 0.0677-inch minimum thickness; coated with rust-inhibitive, baked-on, acrylic enamel.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

1. Provide stainless-steel fasteners for fastening aluminum.
2. Provide stainless-steel fasteners for fastening stainless steel.
4. Provide bronze fasteners for fastening bronze.
B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers; Alloy Group 1 (A1).

D. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.

1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

E. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.

F. Post-Installed Anchors: chemical anchors.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.


2.4 MISCELLANEOUS MATERIALS

A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

B. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

D. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches (3.2 by 38 mm), with a minimum 6-inch (150-mm) embedment and 2-inch (50-mm) hook, not less than 8 inches (200 mm) from ends and corners of units and 24 inches (600 mm) o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
   1. Fabricate units from slotted channel framing where indicated.
   2. Furnish inserts for units installed after concrete is placed.

C. Galvanize miscellaneous framing and supports where indicated.
D. Prime miscellaneous framing and supports with Universal Shop Primer unless otherwise indicated.

2.7 LOOSE STEEL LINTELS
A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.

B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span, but not less than 8 inches (200 mm) unless otherwise indicated.

C. Galvanize loose steel lintels located in exterior walls.

2.8 STEEL WELD PLATES AND ANGLES
A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.9 FINISHES, GENERAL
A. Finish metal fabrications after assembly.

B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.10 STEEL AND IRON FINISHES
A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

1. Shop prime with universal shop primer unless indicated.

C. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:

2. Other Items: SSPC-SP 3, "Power Tool Cleaning."
D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:

1. Cast Aluminum: Heavy coat of bituminous paint.
2. Extruded Aluminum: Two coats of clear lacquer.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
B. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.

C. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article.

1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

3.3 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 05 50 00
SECTION 06 10 00
ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Wood blocking and nailers.

1.2 DEFINITIONS
A. Exposed Framing: Framing not concealed by other construction.
B. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.
C. Timber: Lumber of 5 inches nominal or greater in least dimension.
D. Lumber grading agencies, and the abbreviations used to reference them, include the following:
   2. NLGA: National Lumber Grades Authority.
   3. RIS: Redwood Inspection Service.
   5. WCLIB: West Coast Lumber Inspection Bureau.

1.3 ACTION SUBMITTALS
A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
   1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
   2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.4 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated wood.
2. Fire-retardant-treated wood.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.

B. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal thickness or less, 19 percent for more than 2-inch nominal thickness unless otherwise indicated.
C. Engineered Wood Products: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.

1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Provide fire-retardant-treated materials unless otherwise indicated, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Use treatment that does not promote corrosion of metal fasteners.

2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
3. Design Value Adjustment Factors: Treated lumber shall be tested according to ASTM D 5664 and design value adjustment factors shall be calculated according to ASTM D 6841.

C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

E. Application: Treat items indicated on Drawings, and the following:
   1. Concealed blocking.
   2. Plywood backing panels.

2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
   1. Blocking.
   2. Nailers.

B. For items of dimension lumber size, provide Construction or No. 2 grade lumber of any species.

C. For concealed boards, provide lumber with 15 percent maximum moisture content and any of the following species and grades:
   1. Mixed southern pine; No. 2 grade; SPIB.
   2. Hem-fir or hem-fir (north); Construction or No. 2 Common grade; NLGA, WCLIB, or WWPA.
   3. Spruce-pine-fir (south) or spruce-pine-fir; Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
   4. Eastern softwoods; No. 2 Common grade; NeLMA.
   5. Northern species; No. 2 Common grade; NLGA.
   6. Western woods; Construction or No. 2 Common grade; WCLIB or WWPA.

D. For lumber backing sheet metal fascias or other sheet metal fabrications provide not less than Construction or No. 2 Common grade selected for straightness.
   1. Kerf lumber of larger than 4” actual dimension in longest direction to prevent warping after installation.

E. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

F. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
G. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.5 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: DOC PS 1, Exterior, AC, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.

B. Nails, Brads, and Staples: ASTM F 1667.


D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1.

F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry assemblies and equal to four times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

2.7 MISCELLANEOUS MATERIALS

A. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch (0.6 mm).
PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.

B. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant treated plywood backing panels with classification marking of testing agency exposed to view.

C. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

D. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

E. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use copper naphthenate for items not continuously protected from liquid water.

F. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

C. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
3.3 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes sufficiently wet that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 06 10 00
SECTION 06 4500
CUSTOM PLASTIC-LAMINATE CASEWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Summary of the Work: Furnish delivered to jobsite, unloaded, set in place, leveled and scribed, the work of this Section as indicated on the drawings and as specified and required for a complete installation.

B. Section Includes:

1. Custom casework: high pressure decorative laminate finish.
2. Countertops: high pressure decorative laminate finish.
3. Hardware customarily furnished by the casework manufacturer.
4. Installation.

C. Related Requirements:

1. Section 06 1000 "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets and concealed within other construction before cabinet installation.
2. Section 05 5000 “Metal Fabrications.”
3. Section 07 9200 “Joint Sealants.”
4. Division 10, Specialties.
5. Division 11, Equipment.
6. Division 22, Plumbing.
7. Division 26, Electrical.

1.2 REFERENCES


B. ANSI/BHMA A156.9 – Cabinet Hardware.

C. NEMA LD3 – High Pressure Decorative Laminate.


G. PVA adhesive (polyvinyl acetate) white glue, Type II ASTM-D3110.
H. Aliphatic adhesive (carpenter’s glue) Type II.
J. Forest Stewardship Council.

1.3 ACTION SUBMITTALS
A. Submit as required in Section 01 3300.
B. Shop Drawings:
   1. Prior to commencement of work under this section, submit copies as required in Section 01 3300.
   2. Submit plans and elevations indicating materials, profiles, assembly methods, joint details, fastening methods, and schedule of finishes. Include hardware cut sheets and lock schedules.
   3. Submit drawings with dimensions in units of feet and inches.
C. Samples:
   1. If required by the Architect, submit a selected manufacturer’s current full range of colors and patterns identifying those colors and patterns with premium costs.
   2. Submit one sample of each type of required hardware in specified finish.
   3. Submit one set of samples showing the current full range of colors for 0.5mm and 3mm PVC edge banding for selection by the Architect.

1.4 QUALITY ASSURANCE
A. Perform work in accordance with AWI Quality Standards, current addition.
B. Work in this Section shall comply with the specified Grade(s) or Work and Section(s) of the current edition of the Architectural Woodwork Institute Quality Standards.
C. Woodwork manufacturers shall be certified by the AWI Quality Certification Program as competent to perform the work specified.
D. Contractors and their personnel engaged in the work of this section shall be able to demonstrate successful experience with work of comparable extent, complexity and quality to that shown and specified.

1.5 DELIVERY, STORAGE, AND HANDLING
A. Deliver materials to job site in a timely manner to ensure uninterrupted progress. Deliver all products with protective covering to prevent damage. Promptly remove damaged materials from job site and make timely replacements.
B. Protect units from moisture damage according to AWI Quality Standards, Section 1700, Installation.

C. Environmental Limitations: Do not deliver or install wood work until building is enclosed, wet work is complete, and HVAC is operating and maintaining designed temperature and relative humidity levels for the remainder of the construction period.

1.6 COORDINATION

A. Coordinate work of this Section with other applicable trades.

B. Pre-cut rough-ins for plumbing, electrical and data wherever possible.

1.7 FIELD MEASUREMENT

A. Where casework is indicated to be fitted to other construction, check actual dimensions of other construction by accurate field measurements before fabrication, and show recorded measurements on final shop drawings.

1.8 WARRANTY

A. Provide a written warranty that all casework materials and workmanship will be free from defects for a period of one year from the date of Substantial Completion of the project. Any defective work is to be repaired or replaced at no cost to the Owner.

PART 2 - PRODUCTS

2.1 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.

1. The Contract Documents contain selections chosen from options in the quality standard and additional requirements beyond those of the quality standard. Comply with those selections and requirements in addition to the quality standard.

B. Grade: Custom.

C. Factory and field applied adhesives must contain no-added urea formaldehyde.
2.2  SHEET MATERIALS

A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

   1. Wood Moisture Content: 4 to 9 percent.

B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

   1. Must contain no-added urea formaldehyde

C. SOFTWOOD PLYWOOD: Graded in accordance with AWI Grade Custom.

   1. Made with binder containing no urea formaldehyde.

D. THERMOSET DECORATIVE OVERLAY: Particleboard or medium density fiberboard with surface of thermally fused, melamine–impregnated decorative paper complying with LMA SAT-1. Color: As selected by Architect from manufacturer’s full line.

E. Sheathing products must contain no-added urea formaldehyde.

2.3  HIGH-PRESSURE DECORATIVE LAMINATE:

A. AVAILABLE MANUFACTURERS: Subject to compliance with requirements, manufacturers offering high pressure decorative laminate that may be incorporated into the work include:

   1. Formica Corporation  [www.formica.com]
   2. Wilsonart International  [www.wilsonart.com]

2.4  LAMINATE COLORS AND PATTERNS

A. As selected by Architect from Manufacturer’s standard finishes.

2.5  HARDWARE

A. OFFICE CABINETRY

   1. Hinges: Provide hinges from one of the following listed Brands:

      a. MEPLA – Model SSP 29, 125 deg. Slide on Hinge.
      b. GRASS – Series 3803 series, 120 deg. Snap on hinge.
      c. BLUM – 120 deg. Clip on hinge.
2. Double acting hinges at gate:
   a. Double acting spring hinge – clamp flange, as manufactured by Bommer Industries, Inc.
      1) Satin chrome finish.
   b. Approved equal.

B. PULLS
1. Door and drawer pulls shall be semi-flush injection molded ABS plastic with round safety corners and surfaces eliminating the possibility of garments and equipment from getting caught.
3. Substitutions for the above products shall be submitted for approval prior to bidding in accordance with the requirements of Division 00, Conditions Governing Procurement.

C. LOCKS: Provide on all doors and drawers. Brand: TIMBERLINE Cam Lock, Model CB-080 through 199 series. Locks to have a Bezel. Strike plates used where appropriate.
   1. Keying Requirements: All locks in a single room shall be keyed alike. Locks shall be keyed different from room to room. Provide 2 master keys.

D. LATCHES: EPCO Model number 1018-N. Use on inactive door opposite locks.

E. DRAWER SLIDES:
   1. Drawer slides for all standard drawers shall be regular extension epoxy coated steel modular system by one of the following:
      a. BLUM METABOX; Drawer System 320 & 330 Series. Color, white.
      b. GRASS ZARGON; Drawer System 6000 Series. Color, white.
      c. MEPLA INTEGRA; Drawer System “Integra Top” Clip on.
   2. Where shown in drawings, file drawers shall have full extension slides and standard file hangers with option for letter or legal size files.

F. MAP CABINET DRAWER SLIDES:
   1. Drawer slides for all map style cabinets shall be regular extension epoxy coated by one of the following:
      a. BLUM 230E; 100 lb. Bottom Mount drawer slide with stay-close detents.
      b. GRASS 6610; 100 lb. Bottom Mount drawer slide with stay-close detents.
      c. MEPLA-AFIT AL 1700; Bottom Mount drawer slide.

G. CASEWORK SHELF SUPPORTS: Bainbridge Mfg, 5mm dual pin part #3220 or equal.
H. HORIZONTAL DIVIDER SUPPORTS: Hafele 5mm steel wire ("magic wire"). Furnish in size appropriate to shelf size.

I. WARDROBE CABINET HARDWARE:
   2. ROD FLANGES: Knape & Vogt #734 & #735 per rod. Chrome-look finish.
   4. HOOKS: IVES #581 single hook and/or #582 dual hook. Refer to drawings for type. Chrome-look finish.
   5. MIRROR: 12” x 12” x 1/4” All edges covered with chrome or molded PVC trim. Fasten to back side of cabinet door with mirror clips.

J. COUNTERTOP WIRING GROMMETS: 2 1/2” diameter with covers. Color black unless otherwise noted.

K. BRACKETS: C-24 Concealed Bracket as manufactured by A & M Hardware.

2.6 MISCELLANEOUS MATERIALS

A. Adhesives: Use adhesives that meet the testing and product requirements of the California Department of Public Health’s "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

B. For adhesives and sealants applied on site within the vapor barrier, provide Product Data documentation including printed statement of VOC content.

PART 3 - EXECUTION

3.1 FABRICATION - CABINET COMPONENTS

A. GENERAL
   2. Reference Section 400-G-3, Identification of Parts, for the criteria of exposed and semi-exposed surfaces.
   3. Cabinet width dimensions are not to exceed 32” for both wall cabinets and base cabinets. Sink base cabinets and Map drawer cabinets will be the only exceptions.
   4. Office Cabinetry style shall be constructed per Section 400-G-7, A; Flush Overlay.
   5. Classroom cabinetry style shall be constructed per Section 400-G-7, B; Reveal Overlay.

B. DRAWERS:
   1. Drawer fronts shall be 3/4” thick particleboard overlaid with high-pressure plastic laminate on both faces. Edges are banded with 3mm PVC with outer edges 1/8” radius. PVC edge colors shall be chosen from the submitted range to compliment or match the face color.
RIO RANCHO PUBLIC SCHOOLS
ENTRY SECURITY MODIFICATIONS
RIO RANCHO, NEW MEXICO

2. Steel Drawer Systems: Drawer bottoms and backs shall be 3/4” thick thermo fused melamine. Color to match cabinet interior. Edges are banded with .5mm PVC color to match cabinet interior.

3. Built Drawer Boxes:
   a. Drawer sides, sub front and backs shall be 1/2” thick minimum thermofused melamine. Color to match cabinet interior. Edges are banded with .5mm PVC color to match cabinet interior.
   b. Drawer bottoms shall be 1/2” thick minimum thermofused melamine. Color to match cabinet interior. Sides are rabbeted to accept bottom and bottom is to be glued and screwed as well as supported by screws from the bottom mount slides.

C. DOORS: Doors shall be 3/4” thick particleboard overlaid with a high-pressure plastic laminate on both faces. Edges shall be banded 3mm PVC with outer edges 1/8” radius. PVC edge colors shall be from the selected range to either match or compliment the face color.

D. CABINET ENDS, TOPS & BOTTOMS:
   1. All panels shall be constructed with 3/4” particleboard as the core material.
   2. At Semi-exposed (see AWI standards for definition and locations) ends, tops or bottoms the particleboard shall be overlaid with thermofused melamine on the exterior face.
   3. At Exposed (see AWI standards for definition and locations) ends, tops or bottoms, the particleboard shall be overlaid with a high pressure decorative laminate on exposed faces. The inside color shall match the cabinet interior with the face color to match exterior color. The front edges shall be banded with .5mm PVC in color as selected by the Architect from the colors submitted.
   4. In cabinets with doors, the interior surfaces of the particleboard shall be overlaid with either high pressure laminate cabinet liner or thermofused melamine. The color shall match the melamine surfaced back color. The front edges shall be banded with .5mm PVC to match exposed face color or as selected by the Architect from the colors submitted.
   5. In open cabinets (without doors), the interior surfaces of the particleboard shall be overlaid with high pressure decorative to match exposed exterior color. The front edges shall be banded with .5mm PVC to match exposed face color or as selected by the Architect from the colors submitted.
   6. All end panels shall be drilled for adjustable shelf supports with .5mm diameter holes on 32mm (1 1/4”) centers. For shelves up to and including 30” depth, two vertical sets of holes shall be provided at each end panel. For shelves over 30” deep, three vertical sets of holes shall be provided at each end panel.

E. FIXED AND ADJUSTABLE SHELVES:
   1. Semi-exposed Shelves: Regardless of cabinet width, all shelves shall be 1” thick particleboard overlaid with thermofused melamine on top and bottom faces. Color to match cabinet interior.
   2. Exposed Shelves: Regardless of cabinet width, all shelves shall be 1” particleboard overlaid with high pressure decorative laminate. Color to match exterior unless otherwise noted on the drawings.
3. All four edges of adjustable shelves and front edge of fixed shelves shall be banded with .5mm edge banding in color to match shelf color or as selected by the Architect from the colors submitted.

F. CABINET BACKS:

1. All semi-exposed cabinet backs shall be 3/4” thick minimum thermofused melamine. Color to match cabinet interior.
2. All exposed backs shall be 3/4” thick minimum particleboard overlaid with a high-pressure plastic laminate. Color to match exterior for exposed backs.
3. Provide removable backs for service access where shown on the project drawings.
4. All backs shall be full bound by all sides, tops and bottoms of the cabinet.

G. DIVIDERS AND PARTITIONS:

1. Vertical dividers and partitions shall be 3/4” particleboard overlaid with thermofused melamine on both faces when semi-exposed and high pressure decorative laminate for exposed surfaces. The exposed edges shall be banded with .5mm PVC to match the other case edges.
2. Fixed Horizontal Dividers: Where indicated on the drawings, dividers less than 6” apart and less than 12” wide shall be 1/4” tempered hardboard grooved into adjacent cabinet members. The edges shall be sanded and entire shelf clear sealed.
3. Adjustable Horizontal Dividers: Where indicated on the drawings, dividers shall be 3/4” particleboard overlaid with thermofused melamine on both faces when semi-exposed and high pressure decorative laminate for exposed surfaces. Dividers shall be grooved to accept steel “magic wire” supports. The exposed edges shall be banded with .5mm PVC to match the other case edges

H. CABINET TOE BASES:

1. Cabinet bases shall be 4” standard height made in continuous lengths to ensure straight, level and true line of casework. The standard core materials shall be 3/4” particleboard. In rooms with floor drains, the core material shall be “Medex” MDF board or equal.
2. Bases shall be unfinished and ready for scheduled base finish to be applied.

I. MAP (FLAT FILE) CABINETS:

1. Drawer slides shall be as required in hardware section 2.6.G.
2. Drawer sides, sub front and backs shall be 1/2” thick minimum thermofused melamine. Color shall match cabinet interior. Edges shall be banded with .5mm PVC color to match cabinet interior.
3. Drawer bottoms shall be 1/2” thick minimum thermofused melamine. Color shall match cabinet interior. Sides shall be rabbeted to accept bottom and bottom is to be glued and screwed as well as supported by screws from the bottom mount slides.
4. Map cabinets over 24” wide shall have 2 pulls per drawer face.
5. Provide a paper curl stop on each drawer box located at the top back of the drawer box. Stop shall be 4” wide by 1/4” thick melamine panel and shall be screw attached.
6. Mobile cabinets shall be finished on all exterior sides, back and top. Provide minimum of 4 casters adequate to support fully loaded weight with ease of transport over both carpet and tiled flooring surfaces.
3.2 FABRICATION – COUNTER TOPS

A. GENERAL:

1. Comply with the AWI Quality Standards (latest edition) Custom Grade. Reference Section 400C
2. Decorative laminate counter tops shall be PF42 NEMA grade laminate with .020” backing sheet bonded to 3/4” particleboard substrate. Adhesives shall be either Type II PVA or contact cement depending on the size of the materials and job conditions.
3. Decorative laminate color selections shall be as selected from manufacturer’s non-premium-priced patterns and colors. Reference Part 2, Section 2.2 and 2.3 for manufacturer brands and color quantity requirements.
4. Counter top thickness shall be as noted in Section B. below.
5. Where tops and back splashes in which sinks occur, utilize an industrial grade particle board or fiberboard with a 24 hour thickness swell factor of 5% or less and a 24 hour water absorption factor of 10% or less.
6. Counter tops shall be furnished in the longest lengths possible. When joints are required, they shall be factory prepared with a minimum of three 1/4” joint bolts each. Joints shall be field assembled with waterproof sealant to ensure stable and rigid construction. Avoid joints within 24” of sinks or knee spaces.

B. COUNTERTOP OPTIONS:

1. PVC Edged Decorative Laminate Counter Tops:
   a. Where called for on the drawings, overall counter top thickness shall be 1 1/4” with buildup added to the substrate. Standard overhang from cabinet body along front shall be 1 1/2”. Exposed end overhang shall be 1/2”.
   b. Front edge of counter tops shall have 3mm PVC edge banding. Edge colors shall be from a select range to either match or compliment the top color.
   c. Back splashes shall be 3/4” thick and 4” high edged with same 3mm PVC banding as front edge unless specified otherwise.

3.3 EXAMINATION

A. Verify adequacy of in wall backing and support framing.
B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work
C. Before installing architectural woodwork, examine shop fabricated work for completion and complete work as required, including back priming and removal of packing.
D. Condition building and woodwork to average prevailing humidity conditions in installation areas before installing.
3.4 INSTALLATION

A. Install work in accordance with AWI Quality Standards (latest edition) Section 1700. Grade Custom.

B. Set and secure materials and components in place, plumb and level. Shim as required with concealed shims.

C. Scribe work abutting other components or work. Refinish cut surfaces or repair damaged finish at cuts.

D. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure to grounds, strapping and blocking with countersunk, concealed fasteners with blind nailing where possible for a complete installation.

E. CABINETS: Install without distortion so that doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the installation of hardware and accessory items as indicated.

F. TOPS: Anchor securely to base units and other support systems as indicated. Caulk space between backsplash and wall with specified sealant.

3.5 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork where possible to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean woodwork on exposed and semi-exposed surfaces. Touch up shop applied finishes to restore damaged or soiled areas.

3.6 PROTECTION

A. Provide final protection and maintain conditions in a manner acceptable to fabricator and installer that ensures that woodwork is without damage or deterioration at the time of Substantial Completion.

END OF SECTION 06 45 00
PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Glass-fiber blanket.
   a. Sound attenuation insulation.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

PART 2 - PRODUCTS

2.1 GLASS-FIBER BLANKET

A. Glass-Fiber Blanket, Unfaced: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

   a. CertainTeed Corporation.
   b. Guardian Building Products, Inc.
   c. Johns Manville; a Berkshire Hathaway company.
   d. Owens Corning.

2. Location: Interior walls, sound attenuation insulation.
B. Where glass-fiber blanket insulation is indicated by the following thicknesses, provide blankets in batt or roll form with thermal resistances indicated:

1. 3-1/2 inches thick with a thermal resistance of 11 deg F x h x sq. ft./Btu at 75 deg F.
2. 3-5/8 inches thick with a thermal resistance of 11 deg F x h x sq. ft./Btu at 75 deg F.
3. 5-1/2 inches thick with a thermal resistance of 19 deg F x h x sq. ft./Btu at 75 deg F.
4. 6-1/2 inches thick with a thermal resistance of 21 deg F x h x sq. ft./Btu at 75 deg F.

2.2 ACCESSORIES

A. Insulation for Miscellaneous Voids:

1. Glass-Fiber Insulation: ASTM C 764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E 84.

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.3 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
4. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:

1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft..
2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

3.4 PROTECTION

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

END OF SECTION 07 21 00
PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Penetrations in fire-resistance-rated walls.

B. Related Sections:

1. Section 07 8446 "Fire-Resistive Joint Systems" for joints in or between fire-resistance-rated construction, at exterior curtain-wall/floor intersections, and in smoke barriers.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Schedule: For each penetration firestopping system. Include location and design designation of qualified testing and inspecting agency.

1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for penetration firestopping.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A firm experienced in installing penetration firestopping similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the
necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its penetration firestopping products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

B. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:

1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:
   a. Penetration firestopping products bear classification marking of qualified testing and inspecting agency.
   b. Classification markings on penetration firestopping correspond to designations listed by the following:
      1) UL in its "Fire Resistance Directory."

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration firestopping per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.6 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping.

C. Notify Owner's testing agency at least seven days in advance of penetration firestopping installations; confirm dates and times on day preceding each series of installations.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

2. Grace Construction Products.
3. Hilti, Inc.
6. NUCO Inc.
8. RectorSeal Corporation.
9. Specified Technologies Inc.
10. 3M Fire Protection Products.
12. USG Corporation.

2.2 PENETRATION FIRESTOPPING

A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.

1. Fire-resistance-rated walls include fire-barrier walls.
2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. W-Rating: Provide penetration firestopping showing no evidence of water leakage when tested according to UL 1479.

D. VOC Content: Penetration firestopping sealants and sealant primers shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.
E. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.

1. Permanent forming/damming/backing materials, including the following:
   a. Slag-wool-fiber or rock-wool-fiber insulation.
   b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
   c. Fire-rated form board.
   d. Fillers for sealants.

2. Temporary forming materials.
5. Steel sleeves.

2.3 FILL MATERIALS

A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.

E. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.
I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.
3.3 INSTALLATION

A. General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.

C. Install fill materials for firestopping by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.

3.4 IDENTIFICATION

A. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing and inspecting agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Owner will engage a qualified testing agency to perform tests and inspections.

B. Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace penetration firestopping to comply with requirements.

C. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.
3.6 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.

3.7 PENETRATION FIRESTOPPING SCHEDULE

A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.

A. Firestop Systems with No Penetrating Items:

2. Type of Fill Materials: One or more of the following:
   a. CP 620 Fire Foam as manufactured by Hilti, Inc.

B. Firestop Systems for void with No Penetrating Items:

2. Type of Fill Materials: One or more of the following:
   a. FS-ONE Sealant as manufactured by Hilti, Inc.
   b. CP 619T Firestop Putty Roll as manufactured by Hilti, Inc.
   c. CP 618 Firestop Putty Stick as manufactured by Hilti, Inc.
   d. CP 617 Firestop Putty Pad as manufactured by Hilti, Inc.
   e. CP 675T Firestop Board as manufactured by Hilti, Inc.

C. Firestop Systems for Metallic Pipes, Conduit, or Tubing:

2. Type of Fill Materials: One or more of the following:
   a. FS-ONE Sealant as manufactured by Hilti, Inc.

4. Type of Fill Materials: One or more of the following:
   a. FS-ONE Sealant as manufactured by Hilti, Inc.
D. Firestop Systems for Nonmetallic Pipe, Conduit, or Tubing:
   2. Type of Fill Materials: One or more of the following:
      a. FS-ONE Sealant as manufactured by Hilti, Inc.

E. Firestop Systems for Electrical Cables:
   2. Type of Fill Materials: One or more of the following:
      a. FS-ONE Sealant as manufactured by Hilti, Inc.

F. Firestop Systems for Cable Trays
   2. Type of Fill Materials: One or more of the following:
      a. CP 620 Fire Foam as manufactured by Hilti, Inc.

G. Firestop Systems for Insulated Pipes:
   2. Type of Fill Materials: One or more of the following:
      a. FS-ONE Sealant as manufactured by Hilti, Inc.

H. Firestop Systems for Steel Ducts:
   2. Type of Fill Materials: One or more of the following:
      a. FS-ONE Sealant as manufactured by Hilti, Inc.
      b. CP601S Elastomeric Firestop Sealant as manufactured by Hilti, Inc.
      c. CP606 Flexible Sealant as manufactured by Hilti, Inc.

END OF SECTION 07 84 13
SECTION 07 84 46
FIRE-RESISTIVE JOINT SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Joints in or between fire-resistance-rated constructions.

B. Related Sections:
   1. Section 07 8413 "Penetration Firestopping" for penetrations in fire-resistance-rated walls, horizontal assemblies, and smoke barriers.

1.2 ACTION SUBMITTALS
A. Product Data: For each type of product indicated.

B. Product Schedule: For each fire-resistive joint system. Include location and design designation of qualified testing agency.

1. Where Project conditions require modification to a qualified testing agency's illustration for a particular fire-resistive joint system condition, submit illustration, with modifications marked, approved by fire-resistive joint system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.3 INFORMATIONAL SUBMITTALS
A. Qualification Data: For qualified Installer.

B. Installer Certificates: From Installer indicating fire-resistive joint systems have been installed in compliance with requirements and manufacturer's written recommendations.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fire-resistive joint systems.

1.4 QUALITY ASSURANCE
A. Installer Qualifications: A firm experienced in installing fire-resistive joint systems similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the
necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its fire-resistive joint system products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

B. Fire-Test-Response Characteristics: Fire-resistive joint systems shall comply with the following requirements:

1. Fire-resistive joint system tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
2. Fire-resistive joint systems are identical to those tested per testing standard referenced in "Fire-Resistive Joint Systems" Article. Provide rated systems complying with the following requirements:

   a. Fire-resistive joint system products bear classification marking of qualified testing agency.
   b. Fire-resistive joint systems correspond to those indicated by reference to designations listed by the following:

      1) UL in its "Fire Resistance Directory."

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not install fire-resistive joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistive joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Install and cure fire-resistive joint systems per manufacturer's written instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.6 COORDINATION

A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.

B. Coordinate sizing of joints to accommodate fire-resistive joint systems.

C. Notify Owner's testing agency at least seven days in advance of fire-resistive joint system installations; confirm dates and times on day preceding each series of installations.
PART 2 - PRODUCTS

2.1 FIRE-RESISTIVE JOINT SYSTEMS

A. Where required, provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which fire-resistive joint systems are installed. Fire-resistive joint systems shall accommodate building movements without impairing their ability to resist the passage of fire and hot gases.

B. Joints in or between Fire-Resistance-Rated Construction: Provide fire-resistive joint systems with ratings determined per ASTM E 1966 or UL 2079:

1. Joints include those installed in or between fire-resistance-rated walls, floor or floor/ceiling assemblies, and roofs or roof/ceiling assemblies.
2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of construction they will join.
3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   b. CEMCO.
   c. Fire Trak Corp.
   d. Grace Construction Products.
   e. Hilti, Inc.
   f. Johns Manville.
   g. Nelson Firestop Products.
   h. NUCO Inc.
   j. RectorSeal Corporation.
   k. Specified Technologies Inc.
   l. 3M Fire Protection Products.
   n. USG Corporation.

C. Exposed Fire-Resistive Joint Systems: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

D. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install fill materials and to maintain ratings required. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing agency for systems indicated.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:

1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by fire-resistive joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing fire-resistive joint system's seal with substrates.

3.3 INSTALLATION

A. General: Install fire-resistive joint systems to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.
C. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
2. Apply fill materials so they contact and adhere to substrates formed by joints.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Where deficiencies are found or fire-resistive joint systems are damaged or removed due to testing, repair or replace fire-resistive joint systems so they comply with requirements.

C. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued and installations comply with requirements.

3.5 CLEANING AND PROTECTING

A. Clean off excess fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by fire-resistive joint system manufacturers and that do not damage materials in which joints occur.

B. Provide final protection and maintain conditions during and after installation that ensure fire-resistant joint systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistant joint systems immediately and install new materials to produce fire-resistant joint systems complying with specified requirements.

3.6 FIRE-RESISTIVE JOINT SYSTEM SCHEDULE

A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHBN.

A. Bottom of Wall Fire-Resistive Joint Systems:

2. Assembly Rating: 1 hour.
3. Type of fill materials: One or more of the following:
   a. CP601S Elastomeric Firestop Sealant as manufactured by Hilti, Inc.
   b. CP606 Flexible Firestop Sealant as manufactured by Hilti, Inc.
   c. FS-ONE Sealant as manufactured by Hilti, Inc.
B. Head-of-Wall Fire-Resistive Joint Systems:

2. Assembly Rating: 1 hour.
3. Type of fill materials: One or more of the following:
   
a. FS611A Sealant as manufactured by Hilti, Inc.
   b. FS-ONE Sealant as manufactured by Hilti, Inc.
SECTION 07 92 00

JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Urethane joint sealants.
3. Latex joint sealants.

B. Related Sections:

1. Section 07 84 46 "Fire-Resistive Joint Systems" for sealing joints in fire-resistance-rated construction.
2. Section 08 80 00 "Glazing" for glazing sealants.
3. Section 09 29 00 "Gypsum Board" for sealing perimeter joints.
4. Section 09 30 00 "Tiling" for sealing tile joints.
5. Section 09 51 13 "Acoustical Panel Ceilings" for sealing edge moldings at perimeters with acoustical sealant.

1.2 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
1.3 INFORMATIONAL SUBMITTALS

A. Preconstruction Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
   1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
   2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

B. Warranties: Sample of special warranties.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

C. Product Testing: Test joint sealants using a qualified testing agency.
   1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
   2. Test according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.

D. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.5 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:
   1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
   2. When joint substrates are wet.
   3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
   4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.
1.6 WARRANTY

A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period as follows:

   a. Pecora 300SL: 5 years from date of Substantial Completion.
   b. Pecora 895NST and 898: 5 years from date of Substantial Completion.
   c. Pecora Dynatrol I-XL: 5 years from date of Substantial Completion.
   d. Pecora AC-20FTR: 2 years from date of Substantial Completion.
   e. Pecora 890NST: 20 years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from natural causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

C. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
D. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

E. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 MANUFACTURERS

A. Basis of Design Manufacturer: Subject to compliance with requirements, provide products as manufactured by Pecora Corporation, Harleysville, PA or one of the manufacturers listed below:

1. Pecora Corporation, Harleysville, PA; basis of design.
2. GE Sealants and Adhesives, Waterford, NY
3. Dow Corning, Midland, MI
4. Sealants as manufactured or supplied by the roofing manufacturer for specific applications required in roofing applications.

2.3 JOINT SEALANT MATERIALS

A. Pecora 300SL

2. Type: Single component, traffic grade, ultra low modulus, neutral moisture curing silicone sealant; Type S, grade NS and SL, Class 25, use T, M, G, O, and A.
3. Movement Capability: 100 percent in extension / 50 percent in compression.

B. Pecora 890NST

1. Application:
   a. Exterior:
      1) Masonry control joints
      2) Door frame perimeter.
      3) Window frame perimeter.
   b. Interior:
      1) Door frame perimeter.
      2) Window frame perimeter.
      3) Gypsum board to masonry.

2. Type: Single component, ultra low modulus, neutral, moisture curing silicone sealant; Type S, Grade NS, Class 25, Use NT, M, G, O and A.
3. Movement Capability: 100 percent in extension / 50 percent in compression.
4. Color: As selected by architect from manufacturer’s standard colors for each application.
C. Pecora 895NST

1. Application: Glazing.
2. Type: Single component, medium modulus, neutral, moisture curing silicone sealant; Type S, Grade NS, Class 25, Use NT, M, G, and A.

D. Pecora Dynatrol I-XL

1. Application: Continuous under door thresholds.
2. Type: Single component, moisture curing polyurethane sealant; Type S, Grade NS, Class 25, Use NT, M, A, and O.

E. Pecora 898 (Sanitary)

1. Application: Interior
   a. Plumbing fixture perimeters.
   b. Casework splashes to walls and casework to wall.
2. Type: Single component, neutral, moisture curing silicone sealant: Type S, Grade NS, Class 25, USDA approved, Use NT, M, G, and A.

F. Pecora AC-20 FTR

2. Type: Single component acrylic latex sealant.
3. Movement Capability: 7 1/2 percent in extension and compression.
4. Color: As selected by architect from manufacturer’s standard colors for each application.

2.4 ACCESSORIES

A. Primers: As recommended by sealant manufacturer for project substrates.

B. Joint Backup:

1. Non-staining, open cell polyurethane for use with the following:
   a. Pecora 890.
   b. Pecora 895.
   c. Pecora Dynatrol I-XL.
   d. Pecora 898.
   e. Pecora AC-20 FTR.
2. Closed cell polyethylene.
   a. Pecora 300SL.

3. Combination Type Backup: Open cell interior with continuous plastic skin.
   a. Dual-Rod by HMC, Inc.
   b. Other combination type backup as approved by sealant manufacturer.
   c. For use with products recommended by sealant manufacturer.


C. Bondbreaker Tape: Pecora Number 531 black polyethylene tape or other as approved by sealant manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

   1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
   2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
      a. Concrete.
      b. Masonry.
      c. Unglazed surfaces of ceramic tile.
   3. Remove laitance and form-release agents from concrete.

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4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
   a. Metal.
   b. Glass.
   c. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
   1. Do not leave gaps between ends of sealant backings.
   2. Do not stretch, twist, puncture, or tear sealant backings.
   3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
   1. Place sealants so they directly contact and fully wet joint substrates.
   2. Completely fill recesses in each joint configuration.
   3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form
smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
4. Provide flush joint profile where indicated per Figure 8B in ASTM C 1193.
5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C 1193.
   
   a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

G. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations.

3.4 FIELD QUALITY CONTROL

A. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 07 92 00
SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY
A. Section includes hollow-metal work.
B. Related Requirements:
   1. "Finish Hardware" for door hardware for hollow-metal doors as shown.

1.2 DEFINITIONS
A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.3 COORDINATION
A. Coordinate anchorage installation 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.

1.4 ACTION SUBMITTALS
A. Product Data: For each type of product.
   1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, temperature-rise ratings, and finishes.
B. Shop Drawings: Include the following:
   1. Elevations of each door type.
   2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
   3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
   4. Locations of reinforcement and preparations for hardware.
   5. Details of each different wall opening condition.
   6. Details of anchorages, joints, field splices, and connections.
   7. Details of accessories.
   8. Details of moldings, removable stops, and glazing.
   9. Details of conduit and preparations for power, signal, and control systems.
C. Samples for Initial Selection: For units with factory-applied color finishes.
D. Samples for Verification:

1. For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches on same substrate as full doors and frames.

E. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

1. Provide additional protection to prevent damage to factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch-high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Amweld International, LLC.
2. Ceco Door Products; an Assa Abloy Group company.
3. Commercial Door & Hardware Inc.
4. Curries Company; an Assa Abloy Group company.
5. Republic Doors and Frames.
6. Steelcraft; an Ingersoll-Rand company.

B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.
2.2 REGULATORY REQUIREMENTS

A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.

B. Fire-Rated, Borrowed-Lite Assemblies: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

2.3 INTERIOR DOORS AND FRAMES

A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Maximum-Duty Doors and Frames: SDI A250.8, Level 4. At locations indicated in the Door and Frame Schedule.

1. Physical Performance: Level A according to SDI A250.4.
2. Doors:
   a. Type: As indicated in the Door and Frame Schedule.
   c. Face: Uncoated, cold-rolled steel sheet, minimum thickness of 0.067 inch (14 gauge).
   d. Edge Construction: Model 2, Seamless.
   e. Core: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core at manufacturer's discretion.

3. Frames:
   a. Materials: Uncoated, steel sheet, minimum thickness of 0.067 inch (14 gauge).
   b. Sidelite Frames: Fabricated from same thickness material as adjacent door frame.
   c. Construction: Full profile welded.

2.4 EXTERIOR HOLLOW-METAL DOORS AND FRAMES

A. Construct exterior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Maximum-Duty Doors and Frames: SDI A250.8, Level 4. At locations indicated in the Door and Frame Schedule.

1. Physical Performance: Level A according to SDI A250.4.

2. Doors:
   a. Type: As indicated in the Door and Frame Schedule.
   b. Thickness: 1-3/4 inches
   c. Face: Metallic-coated steel sheet, minimum thickness of 0.067 inch (14 Gauge), with minimum A40 coating.
   d. Edge Construction: Model 2, Seamless.
   e. Core: Polyurethane.

   1) Thermal-Rated Doors: Provide doors fabricated with thermal-resistance value (R-value) of not less than 2.1 deg F x h x sq. ft./Btu when tested according to ASTM C 1363.

3. Frames:
   a. Materials: Metallic-coated steel sheet, minimum thickness of 0.067 inch (14 gauge), with minimum A40 coating.
   b. Construction: Full profile welded.


2.5 BORROWED LITES

A. Hollow-metal frames of uncoated steel sheet, minimum thickness matching door frame thickness.

B. Construction: Full profile welded.

2.6 FRAME ANCHORS

A. Jamb Anchors:

   1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.

   2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
3. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2.7 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.

D. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

F. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

G. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.

H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

I. Glazing: Comply with requirements in Section 08 80 00 "Glazing."

J. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
2.8 FABRICATION

A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Hollow-Metal Doors:

1. Steel-Stiffened Door Cores: Provide minimum thickness 0.026 inch, steel vertical stiffeners of same material as face sheets extending full-door height, with vertical webs spaced not more than 6 inches apart. Spot weld to face sheets no more than 5 inches o.c. Fill spaces between stiffeners with glass- or mineral-fiber insulation.
2. Fire Door Cores: As required to provide fire-protection ratings indicated.
4. Top Edge Closures: Close top edges of doors with inverted closures, except provide flush closures at exterior doors of same material as face sheets.
5. Bottom Edge Closures: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets.
6. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
7. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.

C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Sidelite Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
2. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
3. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
4. Jamb Anchors: Provide number and spacing of anchors as follows:
   a. Masonry Type: Locate anchors not more than 16 inches from top and bottom of frame. Space anchors not more than 32 inches o.c., to match coursing, and as follows:
      1) Two anchors per jamb up to 60 inches high.
      2) Three anchors per jamb from 60 to 90 inches high.
      3) Four anchors per jamb from 90 to 120 inches high.
      4) Four anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

1) Three anchors per jamb up to 60 inches high.
2) Four anchors per jamb from 60 to 90 inches high.
3) Five anchors per jamb from 90 to 96 inches high.
4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.

5. Head Anchors: Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.

6. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.

   a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
   b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.

E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.

   1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
   2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.

F. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with mitered hairline joints.

   1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
   2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
   3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
   4. Provide loose stops and moldings on inside of hollow-metal work.
   5. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.9 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

   1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.
2.10 ACCESSORIES

A. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.

B. Hollow-Metal Frames: Install hollow-metal frames for doors, sidelites, borrowed lites, and other openings, of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

   a. At fire-rated openings, install frames according to NFPA 80.
   b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
   c. Install frames with removable stops located on secure side of opening.
**d.** Install door silencers in frames before grouting.

**e.** Remove temporary braces necessary for installation only after frames have been properly set and secured.

**f.** Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.

**g.** Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.

2. **Floor Anchors:** Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.

   **a.** Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

3. **Metal-Stud Partitions:** Fully grout frames.

4. **Masonry Walls:** Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.

5. **In-Place Concrete or Masonry Construction:** Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.

6. **Installation Tolerances:** Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

   **a.** Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.

   **b.** Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.

   **c.** Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.

   **d.** Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

**C. Hollow-Metal Doors:** Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. **Non-Fire-Rated Steel Doors:**
   
   **a.** Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch.

   **b.** Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/32 inch.

   **c.** At Bottom of Door: 3/4 inch plus or minus 1/32 inch.

   **d.** Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.

2. **Fire-Rated Doors:** Install doors with clearances according to NFPA 80.

3. **Smoke-Control Doors:** Install doors and gaskets according to NFPA 105.

**D. Glazing:** Comply with installation requirements in Section 08 80 00 "Glazing" and with hollow-metal manufacturer's written instructions.

1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.
3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow-metal work immediately after installation.

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

D. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 08 11 13
SECTION 08 14 16

FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid-core doors with wood-veneer faces.
2. Solid-core doors with plastic-laminate faces.
3. Factory finishing flush wood doors.
4. Factory fitting flush wood doors to frames and factory machining for hardware.

B. Related Requirements:

1. Section 08 80 00 "Glazing" for glass view panels in flush wood doors.

1.2 ACTION SUBMITTALS

A. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:

1. Dimensions and locations of blocking.
2. Dimensions and locations of mortises and holes for hardware.
3. Dimensions and locations of cutouts.
4. Undercuts.
5. Requirements for veneer matching.
6. Doors to be factory finished and finish requirements.
7. Fire-protection ratings for fire-rated doors.

B. Samples for Initial Selection: For plastic-laminate door faces and factory-finished doors.

C. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches (200 by 250 mm), for each material and finish. For each wood species and transparent finish, provide set of three Samples showing typical range of color and grain to be expected in finished Work.
2. Plastic laminate, 6 inches (150 mm) square, for each color, texture, and pattern selected.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.
B. Package doors individually in plastic bags or cardboard cartons.

C. Mark each door on bottom rail with opening number used on Shop Drawings.

1.4 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during remainder of construction period.

1.5 WARRANTY

A. A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.

2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.


PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Algoma Hardwoods, Inc.
2. Eggers Industries.
3. Graham Wood Doors; an Assa Abloy Group company.
5. VT Industries, Inc.

B. Source Limitations: Obtain flush wood doors from single manufacturer.
2.2 FLUSH WOOD DOORS, GENERAL

A. Quality Standard: In addition to requirements specified, comply with AWI's Architectural Woodwork Standards."

1. Contract Documents contain selections chosen from options in quality standard and additional requirements beyond those of quality standard. Comply with those selections and requirements in addition to quality standard.

B. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

1. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.

2. Cores: Provide core specified or mineral core as needed to provide fire-protection rating indicated.

3. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.

   a. Finish steel edges and astragals to match door hardware (locksets or exit devices).

C. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control, based on testing according to UL 1784.

D. Particleboard-Core Doors:

1. Particleboard: ANSI A208.1, Grade LD-1 or Grade LD-2, made with binder containing no urea-formaldehyde.

2. Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware.

3. Provide doors with glued-wood-stave or structural-composite-lumber cores instead of particleboard cores for doors indicated to receive exit devices.

E. Structural-Composite-Lumber-Core Doors:

   a. Screw Withdrawal, Face: 700 lbf.
   b. Screw Withdrawal, Edge: 400 lbf.

F. Mineral-Core Doors:

1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as needed to eliminate through-bolting hardware.
   
a. 4-1/2-by-10-inch lock blocks, in doors indicated to have exit devices.

3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.
   

2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:
   
   1. Grade: Custom (Grade A faces).
   2. Species: Match species of existing clear finished doors.
   3. Cut: Match cut of existing clear finished doors.
   5. Assembly of Veneer Leaves on Door Faces: Balance match.
   6. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
   7. Room Match: Match door faces within each separate room or area of building. Corridor-door faces do not need to match where they are separated by 10 feet or more.
   8. Exposed Vertical Edges: Same species as faces or a compatible species - edge Type A.
   10. Construction: Five plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering. Faces are bonded to core using a hot press.

2.4 PLASTIC-LAMINATE-FACED DOORS

A. Interior Solid-Core Doors:
   
   1. Grade: Custom.
   2. Plastic-Laminate Faces: High-pressure decorative laminates complying with NEMA LD 3, Grade HSH.
   3. Colors, Patterns, and Finishes: As selected by Architect from laminate manufacturer's full range of products.
   5. Core: Particleboard.
   6. Construction: Five plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before faces and crossbands are applied. Faces are bonded to core using a hot press.
LIGHT FRAMES AND LOUVERS

B. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads unless otherwise indicated.
   1. Wood Species: Same species as door faces or Species compatible with door faces.
   2. Profile: Manufacturer's standard shape.
   3. At wood-core doors with 20-minute fire-protection ratings, provide wood beads and metal glazing clips approved for such use.

C. Wood-Veneered Beads for Light Openings in Fire-Rated Doors: Manufacturer's standard wood-veneer noncombustible beads matching veneer species of door faces and approved for use in doors of fire-protection rating indicated. Include concealed metal glazing clips where required for opening size and fire-protection rating indicated.

D. Metal Frames for Light Openings in Fire-Rated Doors: Manufacturer's standard frame formed of 0.048-inch-thick, cold-rolled steel sheet; with baked-enamel- or powder-coated finish; and approved for use in doors of fire-protection rating indicated.

2.5 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
   1. Comply with NFPA 80 requirements for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.

   1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
   2. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

C. Openings: Factory cut and trim openings through doors.

   1. Light Openings: Trim openings with moldings of material and profile indicated.
   2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 08 80 00 "Glazing."
2.6 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

B. Factory finish doors.

C. Transparent Finish:

1. Grade: Custom.
3. Staining: Match color of existing clear finished doors.
4. Effect: Open-grain finish.
5. Sheen: Semigloss.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames, with Installer present, before hanging doors.

1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: Install hardware indicated.

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.

1. Install fire-rated doors according to NFPA 80.
2. Install smoke- and draft-control doors according to NFPA 105.

C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-
rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.

1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.

   a. Comply with NFPA 80 for fire-rated doors.
   b. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.

2. Bevel fire-rated doors 1/8 inch in 2 inches at lock edge; trim stiles and rails only to extent permitted by labeling agency.

D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

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

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

END OF SECTION 08 14 16
SECTION 08 31 13
ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Access doors and frames for walls and ceilings.

1.2 ACTION SUBMITTALS
A. Product Data: For each type of product.
   1. Include construction details, fire ratings, materials, individual components and profiles, and finishes.
B. Shop Drawings:
   1. Include plans, elevations, sections, details, and attachments to other work.
   2. Detail fabrication and installation of access doors and frames for each type of substrate.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS
A. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics according to the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
   1. NFPA 252 or UL 10B for fire-rated access door assemblies installed vertically.
   2. NFPA 288 for fire-rated access door assemblies installed horizontally.

2.2 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS
A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Acudor Products, Inc.
   2. Babcock-Davis.
   3. Jensen Industries; Div. of Broan-Nutone, LLC.
5. Larsen's Manufacturing Company.
6. MIFAB, Inc.
7. Milcor Inc.
8. Nystrom, Inc.

B. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.

C. Flush Access Doors with Exposed Flanges:
   1. Assembly Description: Fabricate door to fit flush to frame. Provide manufacturer's standard-width exposed flange, proportional to door size.
   2. Locations: Wall and ceiling.
   3. Door Size: To be determined in field for each location, adequate for maintenance access at each location, not less than 12 inches square.
   4. Uncoated Steel Sheet for Door: Nominal 0.060 inch, 16 gage.
   5. Frame Material: Same material, thickness, and finish as door.

D. Fire-Rated, Flush Access Doors with Exposed Flanges:
   1. Assembly Description: Fabricate door to fit flush to frame, with a core of mineral-fiber insulation enclosed in sheet metal. Provide self-latching door with automatic closer and interior latch release. Provide manufacturer's standard-width exposed flange, proportional to door size.
   2. Locations: Wall.
   3. Fire-Resistance Rating: Not less than that of adjacent construction.
   4. Uncoated Steel Sheet for Door: Nominal 0.060 inch, 16 gage.
   5. Frame Material: Same material, thickness, and finish as door.

E. Hardware:
   1. Latch; Flush Access Doors: Cam latch operated by screwdriver.
   2. Latch; Fire-Rated, Flush Access Doors: Slam latch operated by knurled knob.

2.3 MATERIALS
A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
B. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

C. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.

D. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 or A60 metallic coating.

E. Frame Anchors: Same type as door face.

F. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

2.4 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access doors to types of supports indicated.

1. Provide mounting holes in frames for attachment of units to metal or wood framing.

D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.

2.5 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Steel and Metallic-Coated-Steel Finishes:

1. Factory Prime: Apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.
PART 3 - EXECUTION

3.1 EXAMINATION
   A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
   B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION
   A. Comply with manufacturer's written instructions for installing access doors and frames.
   B. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.3 ADJUSTING
   A. Adjust doors and hardware, after installation, for proper operation.
   B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 08 31 13
SECTION 08 41 13
ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Storefront framing for punched openings, fixed glazed.
2. Exterior manual-swing entrance doors and door-frame units.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.

1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
2. Include full-size isometric details of each vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:
   a. Joinery, including concealed welds.
   b. Anchorage.
   c. Expansion provisions.
   d. Glazing.
   e. Flashing and drainage.

3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.
   
   1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.

C. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by manufacturer and witnessed by a qualified testing agency or a qualified testing agency.

D. Source quality-control reports.

E. Sample Warranties: For special warranties.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   
   a. Structural failures including, but not limited to, excessive deflection.
   b. Noise or vibration created by wind and thermal and structural movements.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
d. Water penetration through fixed glazing and framing areas.
e. Failure of operating components.

2. Warranty Period: Five years from date of Substantial Completion.

B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:
   a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
   b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.

2. Failure also includes the following:
   a. Thermal stresses transferring to building structure.
   b. Glass breakage.
   c. Noise or vibration created by wind and thermal and structural movements.
   d. Loosening or weakening of fasteners, attachments, and other components.
   e. Failure of operating units.

B. Structural Loads:

1. Wind Loads: As indicated on Drawings.
2. Other Design Loads: As indicated on Drawings.
C. Deflection of Framing Members: At design wind pressure, as follows:

1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane not exceeding 1/175 of the glass edge length for each individual glazing lute or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch, whichever is smaller.
   a. Operable Units: Provide a minimum 1/16-inch clearance between framing members and operable units.

D. Structural: Test according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

E. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:

1. Fixed Framing and Glass Area:
   a. Maximum air leakage of 0.06 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.

2. Entrance Doors:
   a. Pair of Doors: Maximum air leakage of 1.0 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.
   b. Single Doors: Maximum air leakage of 0.5 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.

F. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.

G. Seismic Performance: Aluminum-framed entrances and storefronts shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Seismic Drift Causing Glass Fallout: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.6 at design displacement and 1.5 times the design displacement.
H. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Oldcastle BuildingEnvelope™; provide FG-3000 Thermal frame with Series 500 wide stile standard entrance door or a comparable product by one of the following:

1. Kawneer North America; an Alcoa company.
2. Oldcastle BuildingEnvelope™
3. Tubelite Inc.

B. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing venting windows and accessories, from single manufacturer.

2.3 FRAMING

A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Construction:
   a. Exterior-Thermally broken.
   b. Interior both sides: Nonthermal.

2. Glazing System: Retained mechanically with gaskets on four sides.
3. Glazing Plane: Center to match existing.
5. Fabrication Method: Field-fabricated stick system.

B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

D. Materials:

1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
   a. Sheet and Plate: ASTM B 209.
   b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
   c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
   d. Structural Profiles: ASTM B 308/B 308M.
2. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.
   a. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
   b. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
   c. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.4 ENTRANCE DOOR SYSTEMS

A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.

   1. Door Construction: 1-3/4-inch overall thickness, with minimum 0.125-inch-thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
   2. Door Design: Wide stile; 5-inch nominal width.
      a. Provide nonremovable glazing stops on outside of door.

B. Entrance Door Hardware: As indicated.

2.5 GLAZING

A. Glazing: Comply with Section 08 80 00 "Glazing."

B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

C. Glazing Sealants: As recommended by manufacturer.
   1. Sealant shall have a VOC content of 250 g/L or less.

D. Weatherseal Sealants: ASTM C 920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and structural-sealant-glazed storefront manufacturers for this use.
   2. Weatherseal Sealants: Sealant shall have a VOC content of 250 g/L or less.
2.6 ACCESSORIES

A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.
3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.

B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

C. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

D. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil thickness per coat.

1. Bituminous Paint: Mastic coating shall have a VOC content of 250 g/L or less.

2.7 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Physical and thermal isolation of glazing from framing members.
4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Provisions for field replacement of glazing from interior.
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

1. At exterior doors, provide compression weather stripping at fixed stops.

E. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
F. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

G. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.8 ALUMINUM FINISHES

A. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.
   1. Color: Dark bronze, match aluminum color on existing building.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:
   1. Comply with manufacturer's written instructions.
   2. Do not install damaged components.
   3. Fit joints to produce hairline joints free of burrs and distortion.
   4. Rigidly secure nonmovement joints.
   5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
   6. Seal perimeter and other joints watertight unless otherwise indicated.

B. Metal Protection:
   1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
   2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Set continuous sill members and flashing in full sealant bed as specified in Section 07 9200 "Joint Sealants" to produce weathertight installation.

D. Install components plumb and true in alignment with established lines and grades.
E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.

F. Install glazing as specified in Section 08 8000 "Glazing."

G. Install weatherseal sealant according to Section 07 9200 "Joint Sealants" and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.

H. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
   1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
   2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.3 ERECTION TOLERANCES

A. Erection Tolerances: Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:
   1. Plumb: 1/8 inch in 10 feet; 1/4 inch in 40 feet.
   2. Level: 1/8 inch in 20 feet; 1/4 inch in 40 feet.
   3. Alignment:
      a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch wide, limit offset from true alignment to 1/16 inch.
      b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch wide, limit offset from true alignment to 1/8 inch.
      c. Where surfaces are separated by reveal or protruding element of 1 inch wide or more, limit offset from true alignment to 1/4 inch.
   4. Location: Limit variation from plane to 1/8 inch in 12 feet; 1/2 inch over total length.

3.4 ADJUSTING ENTRANCE DOORS

A. Adjust operating entrance door hardware to function smoothly as recommended by manufacturer.
   1. For entrance doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches (75 mm) from the latch, measured to the leading door edge.
3.5 ADJUSTING, CLEANING, AND PROTECTION OF WINDOWS

A. Adjust operating sashes and ventilators, screens, hardware, and accessories for a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts.

B. Clean aluminum surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

C. Clean factory-glazed glass immediately after installing windows. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.

D. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

E. Protect window surfaces from contact with contaminating substances resulting from construction operations. In addition, monitor window surfaces adjacent to and below exterior concrete and masonry surfaces during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written recommendations.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain window operating system.

END OF SECTION 08 41 13
PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Tubular daylighting device consisting of roof dome, reflective tube, and diffuser assembly.

1.2 PERFORMANCE REQUIREMENTS

A. Tubular daylighting device assembly capable of meeting the following performance requirements:

1. Air Infiltration Test: Air infiltration not to exceed 0.30 cfm/sf aperture with a pressure difference of 1.57 psf across the tube when tested in accordance with ASTM E 283.
2. Water Resistance test: No uncontrolled water leakage at 10.5 psf pressure differential with water rate of 5 gallons/hour/sf when tested in accordance with ASTM E 547.
3. Uniform Load Test:
   a. No breakage, permanent damage to fasteners, hardware parts, or damage to make daylighting system inoperable or cause excessive permanent deflection of any section when tested at a positive load of 150 psf or a negative load of 70psf.
   b. All units shall be tested with a safety factor of (3) for positive pressure and (2) for negative pressure, acting normal to plane of roof in accordance with ASTM E 330.
4. Fire Testing:
   b. Smoke Density – Rating not greater than 450 per ASTM Standard E 84 in way intended for use. Classification C.
   c. Rate of burn and/or extent – Maximum Burning Rate: 2.5 inches/minute. Classification CC-2 per ASTM D 635.
   d. Rate of burn and/or extent – Maximum Burning Extent: 1 inch. Classification CC-1 per ASTM D 635.
1.3 ACTION SUBMITTALS

A. Product Data: For each type of unit skylight.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for unit skylights.
   2. Motors: Show nameplate data, power requirements, ratings, characteristics, and mounting arrangements.
   3. Storage and handling requirements and instructions.
   4. Preparation recommendations and instructions.
   5. Installation methods.

B. Shop Drawings: For unit skylight work.
   1. Include plans, elevations, sections, details, and connections to supporting structure and other adjoining work.
      a. Wiring Diagrams: For power, signal, and control wiring for electric motors of operable unit skylights.

C. Product Schedule: For unit skylights.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer and manufacturer.

B. Product Test Reports: For each type and size of unit skylight, for tests performed within the last four years by a qualified testing agency. Test results based on testing of smaller unit skylights than specified will not be accepted.

C. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For tubular daylighting device(s) to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer capable of fabricating tubular daylighting devices that meet or exceed performance requirements indicated and of documenting this performance by inclusion in lists and by labels, test reports, and calculations. A manufacturer engaged in the manufacture of tubular daylighting devices for a minimum of 15 years.
B. Installer Qualifications: An installer acceptable to unit skylight manufacturer for installation of units required for this Project.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of unit skylights that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Uncontrolled water leakage.
   b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
   c. Yellowing of acrylic glazing.

2. Warranty Period: Daylighting Device 10 years from date of Substantial Completion.
3. Warranty Period: Electrical Parts 5 years from date of Substantial Completion.

1.8 COORDINATION

A. Coordinate with existing roof manufacturer to ensure that the existing roof warranty remains in effect after installation.

1. Verify that penetration details are in accordance with requirements of existing roof manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated or comparable product by one of the following:

2. Approved equal.

2.2 TUBULAR DAYLIGHTING DEVICES

A. General: Provide transparent roof-mounted skylight dome and self-flashing curb, reflective tube, and ceiling level diffuser assembly transferring sunlight to interior spaces.

B. SolaMaster Series: Solatube Model 750 DS-C penetrating ceiling, 21 inch daylighting system:
1. Roof Dome Assembly: Transparent, UV and impact resistant dome with flashing base supporting dome and top of tube.
   a. Outer Dome Glazing: Type DA, 0.125 inch minimum thickness, injection molded acrylic, classified as CC2 material; UV inhibiting (100% UV C, 100% UV B, and 98.5% UV C), impact modified acrylic blend.
   b. Ray bender 3000: Variable prism optic molded into outer dome to capture low angle sunlight and limit high angle sunlight.
   c. Inner Dome Glazing: Type DAI, 0.115 inch minimum thickness, injection molded acrylic, classified as CC2 material.

2. Roof Flashing Base:
   a. One piece, seamless, leak-proof flashing functioning as base support for dome and top of tube. Sheet steel, corrosion resistant conforming to ASTM A653/A 653M or ASTM A 463/A 463M, 0.028 inch thick.
      1) Base Style: F11, Self Mounted, 11 inches high.

3. Flashing Insulator: Typr F1, Thermal isolation material for use under flashing.

4. Tube Ring: Attached to top of base section; 0.009 inch nominal thickness injection molded high impact PVC; to prevent thermal bridging between base flashing and tubing and channel condensed moisture out of tubing.

5. Reflective tubes: Aluminum sheet, thickness 0.018 inch.
   a. General:
      1) Interior finish: Spectralight Infinity high reflectance specular finish on exposed reflective surface. Specular reflectance for visible spectrum (400nm to 760nm) greater than 99%. Total solar specular reflectance (400nm to 2500nm) less than 80.2%.
      2) Color: a* and b* (defined by CIE L *a*b color model) shall not exceed plus 2 or be less than minus 2 as determined in accordance with ASTM E 308.
   b. Provide extension tubes and angular adaptors to accommodate configuration of installation(s).

6. Diffuser Assemblies for tubes penetrating ceilings: Solatube Model 750 DS-C. Ceiling mounted box transitioning from round tube to square ceiling assembly, supporting light transmitting surface at bottom of tube; 23.8 inch square frame to fit standard suspended ceiling grids or hard ceilings.
   a. Round to square transition box made of opaque polymeric material, classified as CC2, Class C, 0.110 inch thick.
   b. Lens: Type L1 OptiView Fresnel lens with extruded aluminum frame and EPDM foam seal. Visible light transmission shall be greater than 90% at 0.022 inch thick. Classified as CC2.

7. Accessories:

b. Wire Suspension Kit: Type E, use the wire suspension kit when additional bracing to the structure is required.

2.3 ACCESSORY MATERIALS

A. Fasteners: Same material as metals being fastened, non-magnetic steel, non-corrosive metal of type recommended by manufacturer, or injection molded nylon.

B. Suspension Wires: Steel, annealed, galvanized finish, size and type for application and ceiling system requirement.

C. Sealant: Polyurethane or copolymer based elastomeric sealant as provided or recommended by manufacturer.

D. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer’s absolute limits.

3.3 PREPARATION

A. Clean surfaces thoroughly prior to installation.

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

3.4 INSTALLATION

A. Install according to the manufacturer’s written instructions.
B. After installation of first unit, field test to determine adequacy of installation. Conduct water test in the presence of Owner, Architect, and Contractor, or their designated representatives. Make any corrections needed before proceeding with installation of remaining units.

3.5 PROTECTION AND CLEANING

A. Protect installed products until completion of project.

B. Touch-up to “like-new” condition, repair or replace damaged products before Substantial Completion.

1. Remove and replace glazing that has been broken, chipped, cracked, abraded, or damaged during construction period.

C. Clean exposed daylighting device surfaces according to manufacturer's written instructions. Touch up damaged metal coatings and finishes.

D. Remove excess sealants, glazing materials, dirt, and other substances.

E. Protect daylighting device surfaces from contact with contaminating substances resulting from construction operations.

F. Daylighting Device Operating System: Clean and lubricate joints and hardware. Adjust for proper operation.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain unit skylight operating system.

END OF SECTION 08 62 01
SECTION 08 71 00
FINISH HARDWARE

PART I - GENERAL

1.01 DESCRIPTION

A. Summary:
   1) Butts, Hinges.
   2) Locks and Cylinders.
   3) Exit Devices.
   4) Keying.
   5) Closers.
   6) Door Trim.
   7) Overhead Stops.
   8) Thresholds.
   9) Weatherstrip / Seals.

1.02 QUALITY ASSURANCE

A. SUPPLIER QUALIFICATIONS: The hardware supplier must have in his/her employment an Architectural Hardware Consultant (AHC), as recognized by the Door And Hardware Institute, with a minimum of 10 years of Architectural Hardware experience or an equivalent person with 20 years of Architectural Hardware experience, who shall be responsible for the detailing, scheduling, and ordering of the finish hardware for this Contract.

B. DESIGN CRITERIA: Provide Underwriter’s Laboratory listed hardware for fire or accident hazard where scheduled or required to maintain rating of openings. Comply with requirements of door and door frame labels. Comply with NFPA No. 80 and local codes that are in effect in the area of the project.

C. A pre-installation meeting shall be conducted prior to installation of the finish hardware at Project site. Meet with the Owner’s representative, General Contractor, installer, hardware supplier, and manufacturer’s representatives to review catalogs, brochures, templates, installation instructions, and the approved hardware schedule. Survey installation procedures and workmanship, with special emphasis on unusual conditions, as to ensure correct technique of installation, and coordination with other work. Notify participants at least 5 working days before conference.

D. The Architectural Hardware Consultant (A.H.C.) or equivalent (as stated above), as employed by the material supplier of this section, in conjunction with the manufacturer’s factory representative for locks, Computer
-managed locking devices, closers, and exit devices, along with the lead finish hardware installer shall inspect complete installation and certify that the hardware, installation, and adjustment of the hardware items has been furnished and installed in accordance with manufacturer’s instructions and as specified herein.

1.03 SUBMITTALS

A. Hardware Schedule: Within 10 days after receipt of a contract for the finish hardware, prepare a complete schedule and submit 8 copies of the hardware schedule with 3 copies of catalogue cuts, highlighted to show each different hardware item to the Architect for review.

B. Do not order hardware until a corrected copy of the schedule is returned to the supplier bearing the approval of the Architect.

This schedule shall indicate the following details:

- Door numbers
- Frame materials
- Location
- Hand of door
- Size and thickness of door
- Degree of opening
- Door material
- Type of attachment
- Door Number / Heading Index

C. Templates: After receipt of the approved corrected hardware schedule, upon request the hardware supplier shall send 4 sets of all templates and corrected hardware schedule to the general contractor for distribution to the wood door, metal door, and frame manufacturers /suppliers.

D. Operation and Maintenance Manuals: Comply with Project Closeout, Section 01770.

E. Warranties: Submit manufacturer’s specimen warranties for review.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Deliver hardware to the jobsite only after proper provision for storage has been made. NO DIRECT SHIPMENTS WILL BE ALLOWED.

B. Properly package and clearly identify each item relative to the hardware schedule.

C. The hardware supplier shall authorize his representative to be present when all finish hardware is delivered to the jobsite and shall check-in each item and turn over to the General Trades Contractor for storage in a secure place under lock and key.

1.05 WARRANTY

Furnish 3 copies of the following written warranty to be included in the Maintenance Manual:

1. Warranty against mechanical failure of exit devices for a 3 year period.
2. Warranty against mechanical failure of locksets and cores for a 3 year period.
3. Warranty against mechanical failure of door closers for a 10 year period.
4. Warranty against failure of parts of all hardware except exit devices, locksets, and door closers for a 1 year period.
5. Starting date for all warranty periods to be the date of substantial completion.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Butts: Ives, Bommer, Hager, Stanley IVE
B. Exit Devices: Von Duprin - *** VON
C. Door Closers / Auto Operators: Record- *** REC
D. Locksets & Cylinders: Schlage - *** SCH
E. Thresholds & Weatherstrip: Zero, National Guard, Reese, Pemko ZER
F. Stops & Door Trim: Ives, Trimco, Quality, Rockwood IVE
G. O/H Stops: Glynn Johnson, Rixson GLY

*** Owner’s Standard - NO SUBSTITUTES

2.02 SCHEDULED HARDWARE

A. Requirements for design: grade, function, finish, size, and other distinctive qualities of each type of Builders Hardware is indicated in the Hardware Schedule at the end of this section. Products are identified by using manufacturers hardware product numbers.

B. Manufacturer’s Product Designation: One or more manufacturers are listed for each hardware type required. The initial after the manufacturer’s name indicates whose product designation is used in the Hardware Schedule for purposes of establishing minimum requirements. Provide either the product designated or where more than one manufacturer is listed, the comparable product of one of the other manufacturers which comply with requirements including those specified elsewhere in the section.

2.03 MATERIALS AND FABRICATION

A. Hand of Door: The drawings show the direction of slide, swing, or hand of each door leaf. Furnish each item of hardware for proper installation and operation of the door movement as shown.

B. Base Metals: Produce hardware units of the basic metal and forming method indicated using the manufacturer’s standard metal alloy, composition, temper, and hardness. Do not Furnish “Optional” materials or forming methods for those indicated except as otherwise specified.

C. Fasteners: Manufacture hardware to conform to published templates generally prepared for machine screw installation. Do not provide hardware which has been prepared for self-tapping screws except as specifically indicated.

1. Furnish screws for installation with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any
condition) screws to match the hardware finish or if exposed in surfaces of other work to match the finish of such other work as closely as possible including prepared for paint" in surfaces to receive painted finish.
   a. Sex Bolts: Install door closer, door holders, and exit devices on ALL doors by means of thru bolts and sex nuts.

2. Provide concealed fasteners for hardware units which are exposed when the door is closed except to the extent no standard units of the type specified are available with concealed fasteners. Do not use thru bolts for installation where the bolt head or the nut on the opposite face is exposed in other work except where it is not feasible to adequately reinforce the work.

3. Where wood screws are provided for anchoring to walls, the length shall be long enough to penetrate at least halfway into 2X wall blocking.

2.04 BUTTS, HINGES, AND PIVOTS

A. Templates: Provide only template produced units.

B. Screws: Furnish Phillips flat-head all purpose or machine screws for installation of units except furnish Phillips flat-head all purpose wood screws for installation of units into wood. Finish screw heads to match surface of hinges or pivots.

C. Hinge Pins: Except as otherwise indicated provide hinge pins as follows:
   1. Steel Hinges: Steel pins
   2. Non-ferrous Hinges: Stainless steel pins
   3. Exterior Doors: Non-removable pins (NRP)
   4. Interior doors: Non-rising pins
   5. Tips. Flat button and matching plug finished to match leaves

D. Number of hinges: Provide number of hinges indicated but not less than 3 hinges per door leaf for doors 90" or less in height and 1 additional hinge for each 30" of additional height.

E. Size of hinge leaves: 4.5" high, except 5" for doors 3’6” wide and wider.

F. Width of hinges: Shall be sufficient to clear trim projection when door swings 180 degrees.

G. Fire rated doors over 8’0” shall have heavy weight hinges.

H. All hinges SHALL be made of steel and have steel ball bearings where specified.
2.05 KEYING

A. The hardware supplier shall make available to the Architect and/or Owner a representative for the purpose of consulting and reviewing the project’s keying requirements and make a written proposal of the complete key system.

B. Proposed key plan shall include expansion potential for the Owner’s future requirements.

C. All locksets and cylinders SHALL be keyed to THE EXISTING SCHLAGE D OR T-EVEREST RESTRICTED Masterkey system as directed by Steve Gallegos, Locksmith, Rio Rancho Public Schools. All mortise and rim cylinders shall have FSIC construction cores. All locksets to be equipped with cylinders Keyed Alike to match FSIC construction core bitting for use during construction.

D. Permanent cores shall be keyed/combined in sets or subsets, master keyed or great grand master keyed, as directed by Owner. Permanent keys and cylinders/cores shall be marked with the applicable blind code for identification. These visual key control marks or codes will not include the actual key cuts. Permanent keys will also be stamped “Do Not Duplicate - Patented”. Keys and cylinder identification stamping to be approved by the Owner. Failure to properly comply with these requirements may be cause to require replacement of all or any part of the cylinders and keys involved as deemed necessary at no additional cost to the Owner.

E. Equip locks and cylinders with patent protected, full size cores with nickel silver blocking pins to check for patented feature on keys. Provide a minimum of six pins with nickel silver bottom pins. Cylinder cores must allow for multiplex master keying, combined to Owner’s instructions.

F. It is the material suppliers responsibility to de-activate the construction keying and to deliver all permanent key blanks and other security keys direct to Owner’s representative. Failure to properly comply with these requirements may be cause to require replacement of all or any part of the cylinders and keys involved as deemed necessary at no additional cost to the Owner.

G. Keys Required: Furnish quantity of keys as follows:
   1. Five (5) Master Keys.
   2. Two (2) keys per lock or cylinder.
   3. Two (2) core keys.
   4. Fifteen (15) construction keys.

H. All keys shall be made of nickel silver.

2.06 CYLINDRICAL TYPE LOCKSETS


B. Chassis: Cylindrical design, corrosion - resistant plated cold-rolled steel.

D. Lever Trim: Accessible design, independent operation, spring-cage supported, minimum 2" clearance from lever mid-point to door face.

E. Locks shall be of such construction that when locked, the door may be opened from within by using lever and without the use of a key or special knowledge.

F. Rosettes: Minimum 3-7/16" diameter for coverage of ANSI/DHI A115.18, 1994 door preparation, through-bolt lugs on both spring cages to fully engage this pattern.

G. Springs: Full compression type.

H. Strikes: 16 gage curved steel, bronze or brass with 1" deep box construction, lips of sufficient length to clear trim and protect clothing.

2.07 DEADLOCKS

A. Deadlocks shall be mortise type with interior parts made of steel or bronze.

B. All steel parts shall be bronze plated or coated with zinc-dichromate to resist rusting and corrosion.

2.08 CLOSER AND DOOR CONTROL DEVICES

A. Surface type door closers shall be fully hydraulic, full rack and pinion action with a one piece forge steel piston 1-1/2" diameter minimum, and have a cast iron case. Hydraulic fluid shall be of a type requiring no seasonal adjustments for temperatures from 120 degrees F. to -30 degrees F. Pinion shaft shall be minimum of 11/16" diameter. Barrier-free where designated.

B. Separate adjusting valves shall be provided for closing speed, latching speed and backcheck.

C. Adjusting valves shall be made of a metal material, concealed, adjustable only with special wrench and shall be seated with “O” type rings.

D. All closers shall be supplied with forged steel main arms and outswinging doors to be supplied with HEAVY DUTY forged steel parallel arms.

E. Closers shall NOT be supplied with “Pressure Relief Valves”.

2.09 EXIT DEVICES

A. Exit devices: Von Duprin as scheduled with push-through pad design, no exposed touch bar fasteners, no exposed cavities when operated.

B. Provide certification by independent testing laboratory that specified devices have completed over 1,000,000 cycles and still perform in accordance to ANSI/BHMA A156.3 - 1997.

C. All internal parts shall be of cold-rolled steel with zinc dichromate coating.

D. Mechanism case shall have an average thickness of .140"
E. Compression spring engineering.

F. Non-handled basic device design with center case interchangeable with all functions.

G. All devices shall have quiet return fluid dampeners.

H. All latchbolts for wide stile devices shall be deadlocking with 3/4" throw and have a self-lubricating coating to reduce friction and wear.

I. Device push bar must release when a force of 32 pounds, or less, of pressure is applied when a force of 250 pounds is applied to the door.

J. Device shall bear UL label for fire and or panic as may be required.

K. All surface strikes shall be roller type and utilize a plate underneath to prevent movement.

L. Lever Trim: "Breakaway" design, forged brass or bronze escutcheon with a minimum of .130" thickness, match lockset lever design.

M. Removable Mullions: Removable with single turn of building key, securely reinstalled without need for key.

N. Furnish glass bead kits for vision lites where required. Devices for flush doors must fit flat on the door.

O. Exit devices shall be able to have latch-bolt monitoring switches, request to exit switches, electric latch-retraction, alarm kits, electric outside trim, or cylinder dogging added to the existing unit as the need arises for future electrified openings without replacing the original exit device.

2.10 DOOR OPERATORS / ADA SPECIAL CLOSERS

A. Operation: Push button, push plate, switch-activated, manual or manual/electric power assisted Push ‘N’ Go opening with power boost closing and holding; comply with ANSI A156.19 and UL 325.

1. Close and center door against stop after each cycle, and hold against drafts, winds and stack pressure.


4. Fail safe: In event of power failure, make door operate manually with controlled spring close as though equipped with a #3 manual door closer, without damage to operator components.

5. Microprocessor control shall have built in the following features:

a) Opening Speed adjustment.
b) Opening Force adjustment (15 lb. Maximum).
c) Time Delay.
d) On-board Diagnostics.
e) On-board power supply.
f) Factory default memory.
g) On/off switch.
h) Hold open switch.
i) Door will safely stop and reverse if an object is encountered in the opening or closing cycle.

B. Equipment: Completely electromechanical; comply with ANSI A156.19 and UL 325.

1. Control box and motor/gear box: Contained in protective housing; precision-machined gears and bearing seats and all-weather lubricant, mounted on vibration isolators.

2. Design for surface-applied interior application.

3. Gears: Manufactured by operator manufacturer specifically for operators.

4. Motor: DC permanent magnet motor with shielded ball bearings. Stop motor when door stops or is fully open and when breakaway is operated.

5. Door operating arm: Forged steel, attached at natural pivot point of door; do not use slide block in top of door.
   a. Exposed arms: Factory-polished and finished to match operator enclosure.

6. Control circuits for actuators and safeties: Low-voltage, NEC Class II.

7. Service conditions: Satisfactory operation between -30 degrees F (-34 degrees C) and 160 degrees F (71 degrees C).

8. Power supply required: 115 VAC.

C. Enclosure: Extruded aluminum header concealing all operating parts except arms and manual control switches.

1. Surface-Applied Mounting: On surface of door frame/wall, maximum of 1/8" (3 mm) above top of door.

2. Provide bottom loading header for access to controls and removable components without removal of door or operator.
   a. No exposed fasteners.


2.11 MISCELLANEOUS DOOR TRIM UNITS

A. Material shall be brass, bronze or stainless steel as appropriate for required finish. Brass bronze material to be 0.050" minimum thickness and stainless steel to be 0.050" minimum thickness. Edges of plates to be beveled and polished except lower edge can be square.
B. Width of plates shall be 2” less than door width.

C. Push Plates: Plate shall be 4” x 16”.

D. Pull Plates: Plate shall be 4” x 16”. Grip shall be extruded or cast bronze or stainless steel located on center of plate.

E. Smoke Seal shall be a self-adhesive SILICONE material measuring 3/8” x 1/4”.

2.12 TOOLS FOR MAINTENANCE

Furnish a complete set of specialized tools as needed for Owner’s continued adjustment, maintenance and removal or replacement of finish hardware.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General: All finish hardware shall be installed by General Contractor.

B. Furnish all items of hardware with attachment screws, bolts, nuts, etc., as required to attach hardware to type of material involved and with finish to match hardware with which they are to be used. Make all attachments to metal by template machine screws.

C. Provide sex nuts and bolts for door closers, forearm shoes of closers, and holding devices.

D. Attached hardware to masonry or concrete with expansion bolts or similar drilled anchors to develop full strength of attached device.

E. Run weatherstripping or soundstripping full height of both jambs and full width of head. Run thresholds full width of opening. Run door bottoms full width of doors. Set expansion anchors in solid masonry, not mortar joints. Set thresholds in caulking by sealant contractor.

3.02 PROTECTION

A. Do not install weatherstrip, smoke seal, door silencers, kickplates, pushplates, door bottoms, and wall stops until after painting is complete. Loosen locksets and panic hardware prior to painting and re-tighten after painting is complete. Mask all hardware or otherwise protect during painting operation.

3.03 ADJUST AND CLEAN

A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.
B. Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

C. Instruct Owner’s personnel in proper adjustment and maintenance of hardware and hardware finishes during the final adjustment of hardware.

D. Adjust all closers to meet ADA Requirements for sweep time and opening force. Set the closer’s backcheck valve to slow the doors opening from 85 degrees on.

3.04 HARDWARE SCHEDULE

A. It is intended the following schedule include all item of finish hardware necessary to complete the work. If a discrepancy is found in the schedule, such as a missing item, improper hardware for frame, door, or fire codes. The Preamble will be the deciding document.

B. All items shall be of proper type for attaching securely to type of material on which they occur.

C. The schedule of materials is as follows:

= Hardware Item Requiring Electrical Coordination
ENTRY SECURITY MODIFICATIONS
RIO RANCHO, NEW MEXICO

CYBER ACADEMY

HARDWARE GROUP NO. 01

DOOR NUMBER:
101B

EACH TO HAVE:

1 EA CONT. HINGE 112HD 628 IVE
1 EA CONT. HINGE 112HD EPT 628 IVE
1 EA POWER TRANSFER EPT10 - BY SECTION 28 13 00 689 VON
1 EA REMOVABLE MULLION KR4954-STAB-ANGLE PLATE 689 VON
1 EA PANIC HARDWARE LD-99-DT 626 VON
1 EA PANIC HARDWARE EL-99-NL - BY SECTION 28 13 00 626 VON
1 EA RIM CYLINDER 20-057 626 SCH
1 EA MORTISE CYLINDER 20-061 626 SCH
2 EA OH STOP 900S SHIM SNB 630 GLY

INSTALL OH STOP BEFORE INSTALLING DOOR CLOSER

1 EA SURFACE CLOSER 4021 TB 689 LCN
1 EA AUTO OPERATOR 6100 SERIES 628 REC
2 EA ACTUATOR MANUFACTURERS STD 630 REC
1 EA MULLION SEAL 8780N X D.H. BLK ZER
2 EA DOOR CONTACT 679-05HM/WD - BY SECTION 28 13 00 BLK SCE
1 EA RX MOTION SENSOR SCANII - BY SECTION 28 13 00 WHT SCE
1 EA POWER SUPPLY PS914 900-BBK 900-2RS - BY SECTION LGR VON 28 13 00

1 EA WIRING DIAGRAM POINT TO POINT / RISER - BY SECTION
28 13 00

1 SET SEALS BY ALUMINUM FRAME SUPPLIER

DOORS NORMALLY CLOSED AND LOCKED.

ENTRY BY VALID CREDENTIAL AT CARD READER OR BY KEY AT RIM CYLINDER.

DURING SCHOOL HOURS DOORS UNLOCKED BY ACCESS CONTROL TIME ZONE MANAGEMENT WITH CAPABILITY OF BEING IMMEDIATELY LOCKED DOWN FROM CENTRAL LOCATION.

RX MOTION SENSOR SHUNTS DOOR FORCED OPEN ALARM IN ACCESS CONTROL SYSTEM.

PRESSING ACTUATOR LOCATED ON VESTIBULE SIDE OF OPENING UNLOCKS DOOR AND STARTS OPENING CYCLE OF ADA OPERATOR.

FREE EGRESS AT ALL TIMES.
HARDWARE GROUP NO. 02

DOOR NUMBER: 101A

EACH TO HAVE:

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BALANCE OF HARDWARE EXISTING

***NOTE: THIS DOOR POWERED BY POWER SUPPLY AT DOOR 101B***

DOORS NORMALLY CLOSED AND LOCKED.

ENTRY BY VALID CREDENTIAL AT CARD READER OR BY KEY AT RIM CYLINDER.

DURING SCHOOL HOURS DOORS UNLOCKED BY ACCESS CONTROL TIME ZONE MANAGEMENT WITH CAPABILITY OF BEING IMMEDIATELY LOCKED DOWN FROM CENTRAL LOCATION.

RX MOTION SENSOR SHUNTS DOOR FORCED OPEN ALARM IN ACCESS CONTROL SYSTEM.

PRESSING ACTUATOR LOCATED ON VESTIBULE SIDE OF OPENING UNLOCKS DOOR AND STARTS OPENING CYCLE OF ADA OPERATOR.

FREE EGRESS AT ALL TIMES.
HARDWARE GROUP NO. 03

DOOR NUMBER:
102

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<td>WS407CVX</td>
<td>630 IVE</td>
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<td>CARD READER</td>
<td>BY SECTION 28 13 00</td>
<td>BLK SCE</td>
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<tr>
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<td>DESK MOUNT BUTTON</td>
<td>660-PB - BY SECTION 28 13 00</td>
<td>628 SCE</td>
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<td>BY SECTION 28 13 00</td>
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<td>WIRING DIAGRAM</td>
<td>POINT TO POINT / RISER - BY SECTION</td>
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DOORS NORMALLY CLOSED AND LOCKED.

ENTRY BY VALID CREDENTIAL AT CARD READER.

EXIT BY VALID CREDENTIAL AT CARD READER.

DOORS MUST UNLOCK UPON ACTIVATION OF FIRE ALARM OR LOSS OF POWER AND MEET ALL REQUIREMENTS OF IBC 1008.1.9.6.
LINCOLN MIDDLE SCHOOL

HARDWARE GROUP NO. 01

DOOR NUMBER:
100

EACH TO HAVE:

1 EA CONT. HINGE 112HD 628 IVE
1 EA CONT. HINGE 112HD EPT 628 IVE
1 EA POWER TRANSFER EPT10 - BY SECTION 28 13 00 689 VON
1 EA REMOVABLE MULLION KR4954-STAB-ANGLE PLATE 689 VON
1 EA PANIC HARDWARE LD-99-DT 626 VON
1 EA PANIC HARDWARE EL-99-NL - BY SECTION 28 13 00 626 VON
1 EA RIM CYLINDER 20-057 626 SCH
1 EA MORTISE CYLINDER 20-061 626 SCH
2 EA OH STOP 900S SHIM SNB 630 GLY

INSTALL OH STOP BEFORE INSTALLING DOOR CLOSER

1 EA SURFACE CLOSER REUSE EXISTING 689 LCN
1 EA AUTO OPERATOR REUSE EXISTING 628 LCN
1 EA MOUNTING PLATE EXISTING TO REMAIN 689 LCN
1 EA KEYSWITCH EXISTING TO REMAIN 689 LCN
2 EA ACTUATOR EXISTING TO REMAIN 630 LCN
1 EA MOUNTING PLATE EXISTING TO REMAIN 689 LCN
1 EA MULLION SEAL 8780N X D.H. 626 ZER
2 EA DOOR CONTACT 679-05HM/WD - BY SECTION 28 13 00 679-05HM/WD - BY SECTION 689 BLK
1 EA RX MOTION SENSOR SCANII - BY SECTION 28 13 00 689 WHT
1 EA POWER SUPPLY PS914 900-BBK 900-4RL - BY SECTION 689 LGR

FREE EGRESS AT ALL TIMES.

ENTRY BY VALID CREDENTIAL AT CARD READER OR BY KEY AT RIM CYLINDER.

DURING SCHOOL HOURS DOORS UNLOCKED BY ACCESS CONTROL TIME ZONE MANAGEMENT WITH CAPABILITY OF BEING IMMEDIATELY LOCKED DOWN FROM CENTRAL LOCATION.

RX MOTION SENSOR SHUNTS DOOR FORCED OPEN ALARM IN ACCESS CONTROL SYSTEM.

PRESSING ACTUATOR LOCATED ON VESTIBULE SIDE OF OPENING UNLOCKS DOOR AND STARTS OPENING CYCLE OF ADA OPERATOR.

FREE EGRESS AT ALL TIMES.
DOOR NUMBER: 101B

EACH TO HAVE:

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DOORS NORMALLY CLOSED AND LOCKED.

ENTRY BY VALID CREDENTIAL AT CARD READER.

EXIT BY VALID CREDENTIAL AT CARD READER.

DOORS MUST UNLOCK UPON ACTIVATION OF FIRE ALARM OR LOSS OF POWER AND MEET ALL REQUIREMENTS OF IBC 1008.1.9.6.
HARDWARE GROUP NO. 12

DOOR NUMBER:
101A  102

EACH TO HAVE:

1 EA  CONT. HINGE       112HD       628  IVE
1 EA  STOREROOM LOCK    ND96PD RHO  626  SCH
1 EA  ELECTRIC STRIKE   6211 FSE - BY SECTION 28 13 00       630  VON
1 EA  AUTO OPERATOR     6100 SERIES            628  REC
2 EA  ACTUATOR          MANUFACTURERS STD       630  REC
1 EA  CARD READER       BY SECTION 28 13 00       630  REC
1 EA  DOOR CONTACT      679-05HM/WD - BY SECTION 28 13 00       628  REC
1 EA  DESK MOUNT BUTTON 660-PB - BY SECTION 28 13 00       628  SCE
1 EA  RX MOTION SENSOR  SCANII - BY SECTION 28 13 00       628  WHT
1 EA  POWER SUPPLY      BY SECTION 28 13 00       628  LGR
1 EA  WIRING DIAGRAM    POINT TO POINT / RISER - BY SECTION 28 13 00
1 SET  SEALS            BY ALUMINUM FRAME SUPPLIER

DOORS NORMALLY CLOSED AND LOCKED.

ENTRY BY VALID CREDENTIAL AT CARD READER OR BY KEY AT LOCK.

RX SWITCH IN MOTION SENSOR SHUNTS DOOR FORCED OPEN ALARM IN ACCESS CONTROL SYSTEM.

FREE EGRESS AT ALL TIMES.
EAGLE RIDGE MIDDLE SCHOOL

HARDWARE GROUP NO. 04

DOOR NUMBER:
101C

EACH TO HAVE:
- 6 EA HW HINGE
- 1 EA DOOR CORD
- 1 EA REMOVABLE MULLION
- 1 EA PANIC HARDWARE
- 1 EA PANIC HARDWARE
- 1 EA RIM CYLINDER
- 1 EA MORTISE CYLINDER
- 1 EA SURFACE CLOSER
- 1 EA AUTO OPERATOR
- 2 EA ACTUATOR
- 2 EA KICK PLATE
- 2 EA WALL STOP
- 1 EA MULLION SEAL
- 2 EA SILENCER
- 1 EA CARD READER
- 1 EA DESK MOUNT BUTTON
- 2 EA DOOR CONTACT
- 1 EA RX MOTION SENSOR
- 1 EA POWER SUPPLY
- 1 EA WIRING DIAGRAM

652 IVE
626 SCE
689 VON
626 VON
626 VON
626 SCH
626 SCH
689 LCN
628 REC
630 REC
630 IVE
630 IVE
BLK ZER
GY IVE
BLK SCE
628 SCE
BLK SCE
WHT SCE
LGR VON

DOORS NORMALLY CLOSED AND LOCKED.
ENTRY BY VALID CREDENTIAL AT CARD READER OR BY KEY AT RIM CYLINDER.
DURING SCHOOL HOURS DOORS UNLOCKED BY ACCESS CONTROL TIME ZONE MANAGEMENT WITH CAPABILITY OF BEING IMMEDIATELY LOCKED DOWN FROM CENTRAL LOCATION.
RX MOTION SENSOR SHUNTS DOOR FORCED OPEN ALARM IN ACCESS CONTROL SYSTEM.
PRESSING ACTUATOR LOCATED ON VESTIBULE SIDE OF OPENING UNLOCKS DOOR AND STARTS OPENING CYCLE OF ADA OPERATOR.
FREE EGRESS AT ALL TIMES.
RIO RANCHO PUBLIC SCHOOLS
ENTRY SECURITY MODIFICATIONS
RIO RANCHO, NEW MEXICO

HARDWARE GROUP NO. 05

DOOR NUMBER:
101B

EACH TO HAVE:

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<thead>
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<td>1 EA</td>
<td>MORTISE CYLINDER 20-061</td>
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<td>SCH</td>
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<td>1 EA</td>
<td>SURFACE CLOSER 4111 EDA TB</td>
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<td>AUTO OPERATOR 6100 SERIES</td>
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***NOTE: THIS DOOR POWERED BY POWER SUPPLY AT DOOR 101C***

DOORS NORMALLY CLOSED AND LOCKED.

ENTRY BY VALID CREDENTIAL AT CARD READER OR BY KEY AT RIM CYLINDER.

DURING SCHOOL HOURS DOORS UNLOCKED BY ACCESS CONTROL TIME ZONE MANAGEMENT WITH CAPABILITY OF BEING IMMEDIATELY LOCKED DOWN FROM CENTRAL LOCATION.

RX MOTION SENSOR SHUNTS DOOR FORCED OPEN ALARM IN ACCESS CONTROL SYSTEM.

PRESSING ACTUATOR LOCATED ON VESTIBULE SIDE OF OPENING UNLOCKS DOOR AND STARTS OPENING CYCLE OF ADA OPERATOR.

FREE EGRESS AT ALL TIMES.
### HARDWARE GROUP NO. 06

**Door Number:** 103

**Each To Have:**

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<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
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<tbody>
<tr>
<td>Hinge</td>
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<tr>
<td>Manual Flush Bolt</td>
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<td>DP2</td>
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<td>Storeroom Lock</td>
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### HARDWARE GROUP NO. 07

**Door Number:** 105

**Each To Have:**

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<tbody>
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<tr>
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<td>ND94PD RHO</td>
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<tr>
<td>Wall Stop</td>
<td>1</td>
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<td>Silencer</td>
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### HARDWARE GROUP NO. 08

**Door Number:** 111

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<td>NDE80PD RHO - BY SECTION 28 13 00</td>
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Doors normally closed and locked.

Entry by valid credential at NDE lock card reader or by key at lock.

RX switch in NDE lock shunts door forced open alarm in access control system.

Free egress at all times.
HARDWARE GROUP NO. 09

DOOR NUMBER:
113B

EACH TO HAVE:

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<tr>
<td>SURFACE CLOSER</td>
<td>4011 TB</td>
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<td>KICK PLATE</td>
<td>8400 10&quot; X 2&quot; LDW</td>
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<td>630  IVE</td>
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<tr>
<td>WALL STOP</td>
<td>WS407CVX</td>
<td>1 EA</td>
<td></td>
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<td>630  IVE</td>
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<tr>
<td>SILENCER</td>
<td>SR64</td>
<td>3 EA</td>
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DOORS NORMALLY CLOSED AND LOCKED.

ENTRY BY VALID CREDENTIAL AT NDE LOCK CARD READER OR BY KEY AT LOCK.

RX SWITCH IN NDE LOCK SHUNTS DOOR FORCED OPEN ALARM IN ACCESS CONTROL SYSTEM.

FREE EGRESS AT ALL TIMES.

HARDWARE GROUP NO. 10

DOOR NUMBER:
114

EACH TO HAVE:

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<td>KICK PLATE</td>
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<td>630  IVE</td>
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<tr>
<td>WALL STOP</td>
<td>WS407CVX</td>
<td>1 EA</td>
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DOORS NORMALLY CLOSED AND LOCKED.

ENTRY BY VALID CREDENTIAL AT NDE LOCK CARD READER OR BY KEY AT LOCK.

RX SWITCH IN NDE LOCK SHUNTS DOOR FORCED OPEN ALARM IN ACCESS CONTROL SYSTEM.

FREE EGRESS AT ALL TIMES.
DOOR NUMBER:
115

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<td>Auto Operator</td>
<td>6100 SERIES</td>
<td>628 REC</td>
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<td>Actuator</td>
<td>MANUFACTURERS STD</td>
<td>630 REC</td>
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<td>Kick Plate</td>
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<tr>
<td>1</td>
<td>Wall Stop</td>
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DOORS NORMALLY CLOSED AND LOCKED.

ENTRY BY VALID CREDENTIAL AT CARD READER.

EXIT BY VALID CREDENTIAL AT CARD READER.

DOORS MUST UNLOCK UPON ACTIVATION OF FIRE ALARM OR LOSS OF POWER AND MEET ALL REQUIREMENTS OF IBC 1008.1.9.6.
RIO RANCHO MIDDLE SCHOOL

HARDWARE GROUP NO. 09

DOOR NUMBER:

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EACH TO HAVE:

3 EA HINGE 5BB1 4.5 X 4.5
1 EA WIRELESS LOCK NDE80PD RHO - BY SECTION 28 13 00
1 EA SURFACE CLOSER 4011 TB
1 EA KICK PLATE 8400 10” X 2” LDW
1 EA WALL STOP WS407CVX
3 EA SILENCER SR64

DOORS NORMALLY CLOSED AND LOCKED.

ENTRY BY VALID CREDENTIAL AT NDE LOCK CARD READER OR BY KEY AT LOCK.

RX SWITCH IN NDE LOCK SHUNTS DOOR FORCED OPEN ALARM IN ACCESS CONTROL SYSTEM.

FREE EGRESS AT ALL TIMES.
HARDWARE GROUP NO. 11

DOOR NUMBER:
102

EACH TO HAVE:

- 3 EA HINGE 5BB1 4.5 X 4.5 NRP 652 IVE
- 1 EA CLASSROOM X STORERM ND70X80PD RHO 626 SCH
- 1 EA ELECTRIC STRIKE 6211 FS - BY SECTION 28 13 00 630 VON
- 1 EA AUTO OPERATOR 6100 SERIES 628 REC
- 2 EA ACTUATOR MANUFACTURERS STD 630 REC
- 1 EA KICK PLATE 8400 10" X 2" LDW 630 IVE
- 1 EA WALL STOP WS407CVX 630 IVE
- 2 EA CARD READER BY SECTION 28 13 00 628 DLK SCE
- 1 EA DESK MOUNT BUTTON 660-PB - BY SECTION 28 13 00 628 DLK SCE
- 1 EA DOOR CONTACT 679-05HM/WD - BY SECTION 28 13 00 628 DLK SCE
- 1 EA POWER SUPPLY BY SECTION 28 13 00 628 LGR SCE
- 1 EA WIRING DIAGRAM POINT TO POINT / RISER - BY SECTION 28 13 00

DOORS NORMALLY CLOSED AND LOCKED.

ENTRY BY VALID CREDENTIAL AT CARD READER.

EXIT BY VALID CREDENTIAL AT CARD READER.

DOORS MUST UNLOCK UPON ACTIVATION OF FIRE ALARM OR LOSS OF POWER AND MEET ALL REQUIREMENTS OF IBC 1008.1.9.6.
HARDWARE GROUP NO. 13

DOOR NUMBER:
101B

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DOORS NORMALLY CLOSED AND LOCKED.

ENTRY BY VALID CREDENTIAL AT CARD READER OR BY KEY AT RIM CYLINDER.

DURING SCHOOL HOURS DOORS UNLOCKED BY ACCESS CONTROL TIME ZONE MANAGEMENT WITH CAPABILITY OF BEING IMMEDIATELY LOCKED DOWN FROM CENTRAL LOCATION.

RX MOTION SENSOR SHUNTS DOOR FORCED OPEN ALARM IN ACCESS CONTROL SYSTEM.

PRESSING ACTUATOR LOCATED ON VESTIBULE SIDE OF OPENING UNLOCKS DOOR AND STARTS OPENING CYCLE OF ADA OPERATOR.

FREE EGRESS AT ALL TIMES.
**HARDWARE GROUP NO. 16**

**DOOR NUMBER:**

101C

**EACH TO HAVE:**

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<td>REMOVABLE MULLION</td>
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<td>BY SECTION 28 13 00</td>
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</table>

***NOTE: THIS DOOR POWERED BY POWER SUPPLY AT DOOR 101B***

DOORS NORMALLY CLOSED AND LOCKED.

ENTRY BY VALID CREDENTIAL AT CARD READER OR BY KEY AT RIM CYLINDER.

DURING SCHOOL HOURS DOORS UNLOCKED BY ACCESS CONTROL TIME ZONE MANAGEMENT WITH CAPABILITY OF BEING IMMEDIATELY LOCKED DOWN FROM CENTRAL LOCATION.

RX MOTION SENSOR SHUNTS DOOR FORCED OPEN ALARM IN ACCESS CONTROL SYSTEM.

PRESSING ACTUATOR LOCATED ON VESTIBULE SIDE OF OPENING UNLOCKS DOOR AND STARTS OPENING CYCLE OF ADA OPERATOR.

FREE EGRESS AT ALL TIMES.

HARDWARE GROUP NO. 18

DOOR NUMBER:
106A

EACH TO HAVE:

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**MOUNTAIN VIEW MIDDLE SCHOOL**

**HARDWARE GROUP NO. 04**

**DOOR NUMBER:**
101C

**EACH TO HAVE:**

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<td>RIM CYLINDER</td>
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<td>POINT TO POINT / RISER - BY SECTION 28 13 00</td>
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</table>

***NOTE: THIS DOOR POWERED BY EXISTING POWER SUPPLY***

**DOORS NORMALLY CLOSED AND LOCKED.**

**ENTRY BY VALID CREDENTIAL AT CARD READER OR BY KEY AT RIM CYLINDER.**

**DURING SCHOOL HOURS DOORS UNLOCKED BY ACCESS CONTROL TIME ZONE MANAGEMENT WITH CAPABILITY OF BEING IMMEDIATELY LOCKED DOWN FROM CENTRAL LOCATION.**

**RX MOTION SENSOR SHUNTS DOOR FORCED OPEN ALARM IN ACCESS CONTROL SYSTEM.**

**PRESSING ACTUATOR LOCATED ON VESTIBULE SIDE OF OPENING UNLOCKS DOOR AND STARTS OPENING CYCLE OF ADA OPERATOR.**

**FREE EGRESS AT ALL TIMES.**
ENTRY SECURITY MODIFICATIONS
RIO RANCHO, NEW MEXICO

HARDWARE GROUP NO. 06

DOOR NUMBER:
103

EACH TO HAVE:

- 6 EA HINGE 5BB1 4.5 X 4.5 NRP 652 IVE
- 2 EA MANUAL FLUSH BOLT FB458 626 IVE
- 1 EA DUST PROOF STRIKE DP2 626 IVE
- 1 EA STOREROOM LOCK ND96PD RHO 14-042 626 SCH
- 2 EA OH STOP 900S SNB 630 GLY
- 1 EA ASTRAGAL 43SP X 188S X D.H. 600 ZER
- 2 EA SILENCER SR64 GY IVE

HARDWARE GROUP NO. 09

DOOR NUMBER:
113B

EACH TO HAVE:

- 3 EA HINGE 5BB1 4.5 X 4.5 652 IVE
- 1 EA WIRELESS LOCK NDE80PD RHO - BY SECTION 28 13 00 626 SCH
- 1 EA SURFACE CLOSER 4011 TB 689 LCN
- 1 EA KICK PLATE 8400 10" X 2" LDW 630 IVE
- 1 EA WALL STOP WS407CVX 630 IVE
- 3 EA SILENCER SR64 GY IVE

DOORS NORMALLY CLOSED AND LOCKED.

ENTRY BY VALID CREDENTIAL AT NDE LOCK CARD READER OR BY KEY AT LOCK.

RX SWITCH IN NDE LOCK SHUNTS DOOR FORCED OPEN ALARM IN ACCESS CONTROL SYSTEM.

FREE EGRESS AT ALL TIMES.
HARDWARE GROUP NO. 10

DOOR NUMBER:
112B    116

EACH TO HAVE:
3 EA HINGE      5BB1 4.5 X 4.5 NRP      652    IVE
1 EA WIRELESS LOCK    NDE80PD RHO - BY SECTION 28 13 00 626    SCH
1 EA SURFACE CLOSER    4111 EDA TB      689    LCN
1 EA KICK PLATE      8400 10" X 2" LDW      630    IVE
1 EA WALL STOP       WS407CVX      630    IVE
3 EA SILENCER      SR64          GY      IVE

DOORS NORMALLY CLOSED AND LOCKED.
ENTRY BY VALID CREDENTIAL AT NDE LOCK CARD READER OR BY KEY AT LOCK.
RX SWITCH IN NDE LOCK SHUNTS DOOR FORCED OPEN ALARM IN ACCESS CONTROL SYSTEM.
FREE EGRESS AT ALL TIMES.
HARDWARE GROUP NO. 11

DOOR NUMBER:
112A

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DOORS NORMALLY CLOSED AND LOCKED.

ENTRY BY VALID CREDENTIAL AT CARD READER.

EXIT BY VALID CREDENTIAL AT CARD READER.

DOORS MUST UNLOCK UPON ACTIVATION OF FIRE ALARM OR LOSS OF POWER AND MEET ALL REQUIREMENTS OF IBC 1008.1.9.6.
HARDWARE GROUP NO. 13

DOOR NUMBER:

101B

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<td>SCANII - BY SECTION 28 13 00</td>
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<td>WIRING DIAGRAM</td>
<td>POINT TO POINT / RISER -BY SECTION</td>
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***NOTE: THIS DOOR POWERED BY EXISTING POWER SUPPLY***

DOORS NORMALLY CLOSED AND LOCKED.

ENTRY BY VALID CREDENTIAL AT CARD READER OR BY KEY AT RIM CYLINDER.

DURING SCHOOL HOURS DOORS UNLOCKED BY ACCESS CONTROL TIME ZONE MANAGEMENT WITH CAPABILITY OF BEING IMMEDIATELY LOCKED DOWN FROM CENTRAL LOCATION.

RX MOTION SENSOR SHUNTS DOOR FORCED OPEN ALARM IN ACCESS CONTROL SYSTEM.

PRESSING ACTUATOR LOCATED ON VESTIBULE SIDE OF OPENING UNLOCKS DOOR AND STARTS OPENING CYCLE OF ADA OPERATOR.

FREE EGRESS AT ALL TIMES.
**HARDWARE GROUP NO. 14**

**DOOR NUMBER:** 101A

**EACH TO HAVE:**
- 1 EA AUTO OPERATOR 6100 SERIES
- 2 EA ACTUATOR MANUFACTURERS STD

**HARDWARE GROUP NO. 15**

**DOOR NUMBER:** 114

**EACH TO HAVE:**
- 3 EA HINGE 5BB1 4.5 X 4.5
- 1 EA STOREROOM LOCK ND96PD RHO
- 1 EA WALL STOP WS407CVX
- 3 EA SILENCER SR64

**HARDWARE GROUP NO. 19**

**DOOR NUMBER:** 113A

**EACH TO HAVE:**
- 3 EA HINGE 5BB1 4.5 X 4.5
- 1 EA PASSAGE SET ND10S RHO
- 1 EA SURFACE CLOSER 4011 TB
- 1 EA KICK PLATE 8400 10" X 2" LDW
- 1 EA WALL STOP WS407CVX
- 3 EA SILENCER SR64

**IT IS THE RESPONSIBILITY OF THE HARDWARE SUPPLIER TO FIELD**

**VERIFY EXISTING CONDITIONS ON HINGE AND STRIKE PREPS AND**

**SUPPLY HINGES AND STRIKES TO FIT INTO THESE PREPS**

**END OF SECTION**

3701 / 3702 / 3703 / 3704 / 3705
08 71 00 – FINISH HARDWARE - 32
SECTION 08 80 00

GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. Glass for windows and doors.
   2. Glazing sealants and accessories.

1.2 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
D. Interspace: Space between lites of an insulating-glass unit.

1.3 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.
B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.
   1. Insulating glass.
C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
1.5 INFORMATIONAL SUBMITTALS

A. Product Certificates: For glass.

B. Product Test Reports: For glass and glazing products, from manufacturer.
   1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.

C. Preconstruction adhesion and compatibility test report.

D. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved by coated-glass manufacturer.

B. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

C. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

1.7 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Test each glass product, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.
   1. Testing is not required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.
1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F.

1.10 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: 10 years from date of Substantial Completion.

C. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.

B. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.
2.2 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

C. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites 6 mm thick.
2. For laminated-glass lites, properties are based on products of construction indicated.
3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.3 GLASS PRODUCTS, GENERAL

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.


B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.

1. Minimum Glass Thickness for Exterior Lites: 6 mm.
E. Strength: Where heat-strengthened float glass is indicated, provide fully tempered float glass. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 GLASS PRODUCTS

A. Clear Annealed Float Glass: ASTM C 1036, Type I, Class 1 (clear), Quality-Q3.

B. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
   1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

2.5 LAMINATED GLASS

A. Laminated Glass: ASTM C 1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
   1. Construction: Laminate glass with polyvinyl butyral interlayer, ionomeric polymer interlayer, or cast-in-place and cured-transparent-resin interlayer to comply with interlayer manufacturer's written instructions.
   2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
   3. Interlayer Color: Clear unless otherwise indicated.

2.6 INSULATING GLASS

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.
   1. Sealing System: Dual seal, with manufacturer's standard primary and secondary sealants.
   2. Spacer: Manufacturer's standard spacer material and construction.
   3. Desiccant: Molecular sieve or silica gel, or a blend of both.

2.7 GLAZING SEALANTS

A. General:
   1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
   2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Sealant shall have a VOC content of 250 g/L or less.
4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 50, Use NT.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Pecora Corporation; 895 or a comparable product by one of the following:
   a. BASF Corporation; Construction Systems.
   b. Dow Corning Corporation.
   c. GE Construction Sealants; Momentive Performance Materials Inc.
   d. Pecora Corporation.
   e. Sika Corporation.
   f. Tremco Incorporated.

2. Glazing Sealants: Sealant shall have a VOC content of 250 g/L or less.

2.8 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Glazing Sealants: Sealant shall have a VOC content of 250 g/L or less.

C. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

D. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

E. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

F. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

G. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.9 FABRICATION OF GLAZING UNITS

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

1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
   a. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

B. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
   1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
   2. Presence and functioning of weep systems.
   3. Minimum required face and edge clearances.
   4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

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

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

F. Provide spacers for glass lites where length plus width is larger than 50 inches.
   1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
   2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

3.5 SEALANT GLAZING (WET)
A. Install continuous spacers, or spacers combined with cylindrical sealant backing, between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel and blocking weep systems until sealants cure. Secure spacers or spacers and backings in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass.

3.6 CLEANING AND PROTECTION
A. Immediately after installation remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.

1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.

C. Remove and replace glass that is damaged during construction period.

D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.7 MONOLITHIC GLASS SCHEDULE
A. Glass Type: Clear annealed, and fully tempered where indicated or where required by officials having jurisdiction, float glass.

1. Minimum Thickness: 6 mm.
2. Safety glazing required.
3.8 LAMINATED GLASS SCHEDULE

A. Glass Type: Clear laminated glass with two plies of annealed, and fully tempered where indicated or where required by officials having jurisdiction, float glass.

1. Minimum Thickness of Each Glass Ply: 3 mm.
2. Interlayer Thickness: 0.030 inch.
3. Safety glazing required.

3.9 INSULATING GLASS SCHEDULE

A. Glass Type: Low-e-coated, clear insulating laminated glass.

1. Overall Unit Thickness: 1 inch.
2. Outdoor Lite: Clear laminated glass with two plies of float glass.

   a. Thickness of Each Glass Ply: 3.0 mm.
   b. Interlayer Thickness: 0.030 inch.

3. Indoor Lite: Clear, fully tempered.

   a. Thickness of Indoor Lite: 6.0 mm.

4. Interspace Content: Air.
5. Low-E Coating: Manufacturer’s low-e coating on third surface.
7. Winter Nighttime U-Factor: 0.29 maximum.
8. Summer Daytime U-Factor: 0.28 maximum.
9. Solar Heat Gain Coefficient: 0.38 maximum.
11. Basis of Design Product: Solarban 60 as manufactured by PPG Industries, Inc. or approved equal.

END OF SECTION 08 80 00
SECTION 08 87 00
GLAZING SURFACE FILMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:

1. Glazing surface films applied to the inside face of existing windows.
   a. Opaque film.
   b. Translucent film.

1.2 SYSTEM DESCRIPTION

A. Design Requirements: Surface film applied to glass surface, edge to edge, uniform throughout.

B. Performance Requirements, opaque film:

1. % Visible Light Transmittance: 1.
2. % Diffuse Visible Light Reflectance (exterior): 87.

C. Performance Requirements, translucent film.

1. % Visible Light Transmittance: 55.
2. % Diffuse Visible Light Reflectance (exterior): 34.

1.3 SUBMITTALS

A. Product Data for product submitted.

B. Samples:

1. Sample for initial selection: manufacturer’s standard product sample.
2. Sample for verification: Film applied to glass, minimum 8”x8”.

3701 / 3702 / 3703 / 3704 / 3705
08 87 00 - FILMS APPLIED TO GLASS - 1
C. Quality Assurance/Control Submittals
   1. Test Reports
   2. Certificates
   3. Manufacturer’s Instructions

D. Closeout Submittals
   1. Manufacturer’s cleaning maintenance instruction to be included as part of the Operation and Maintenance Manual at project closeout.

1.4 QUALITY ASSURANCE

A. Qualifications
   1. Installer:
      a. Trained by manufacturer for installation of product selected.
      b. Experience: Successfully installed minimum 5 similar projects.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing, Shipping, Handling, and Unloading: Follow Manufacturer’s recommendations.

B. Acceptance at Site: Follow Manufacturer’s recommendations.

C. Storage and Protection: Follow Manufacturer’s recommendations.

1.6 PROJECT/SITE CONDITIONS

A. Environmental conditions: Follow Manufacturer’s recommendations for installation.

1.7 WARRANTY

A. Manufacturer’s standard Warranty.

B. Installer’s standard Warranty: Warranty period minimum five years from date of substantial completion.
PART 2 - PRODUCTS

2.1 PRODUCTS

A. Basis of design, opaque film: (100% White Out) as manufactured by Llumar Window Film, CPFilms, Inc. or approved equal.

B. Basis of design, translucent film: NRMV-60 FPS3 (Etched Frost) as manufactured by Llumar Window Film, CPFilms, Inc. or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Site Verification of Conditions: Examine site and substrate with installer present. Do not proceed with installation until unsatisfactory conditions have corrected.

3.2 INSTALLATION

A. Install glazing file according to manufacturer’s written instructions.

3.3 CLEANING

A. Clean inside surface of window with film applied 5 days minimum prior to substantial completion or as part of final cleaning prior to Owner acceptance.

3.4 PROTECTION

A. Protect glazing film from damage for remaining construction after film is installed.

B. Replace any damaged film over the entire window, edge to edge.

END OF SECTION 08 87 00
SECTION 09 22 16
NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Non-load-bearing steel framing systems for interior gypsum board assemblies.
   2. Suspension systems for interior gypsum ceilings, soffits, and grid systems.

B. Related Requirements:
   1. Section 07 21 00 "Thermal Insulation" for sound batt insulation.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For dimpled steel studs and runners, from ICC-ES.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 FRAMING SYSTEMS

A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
   1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.

B. Studs and Runners: ASTM C 645. Use either steel studs and runners or dimpled steel studs and runners.

1. Steel Studs and Runners:
   a. Minimum Base-Metal Thickness: (20 gauge) 0.033 inch.
      1) (16 gauge) 0.53 inch where shown.
   b. Depth: As indicated on Drawings.

2. Dimpled Steel Studs and Runners:
   a. Minimum Base-Metal Thickness: Equivalent (20 gauge) 0.033 inch.
      1) (16 gauge) 0.53 inch standard (non-dimpled) studs where shown.
   b. Depth: As indicated on Drawings.

C. Slip-Type Head Joints: Where indicated, provide one of the following:

1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch- deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

D. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

E. Flat Strap: Steel sheet for bracing in length and width indicated.

1. Minimum Base-Metal Thickness: (20 gauge) 0.033 inch.

F. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base-Metal Thickness: (20 gauge) 0.033 inch.
2. Depth: 7/8 inch.
G. Cold-Rolled Furring Channels: (16 gauge) 0.053-inch uncoated-steel thickness, with minimum 1/2-inch- wide flanges.
   1. Depth: 3/4 inch or as indicated.
   2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum uncoated-steel thickness of (20 gauge) 0.033 inch.
   3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, (16 gauge) 0.062-inch- diameter wire, or double strand of (18 gauge) 0.048-inch- diameter wire.

2.3 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, (16 gauge) 0.062-inch- diameter wire, or double strand of (18 gauge) 0.048-inch- diameter wire.

B. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, (8 gauge) 0.16 inch in diameter.

C. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of (16 gauge) 0.053 inch and minimum 1/2-inch- wide flanges.
   1. Depth: 1-1/2 inches.

D. Furring Channels (Furring Members):
   1. Cold-Rolled Channels: (16 gauge) 0.053-inch uncoated-steel thickness, with minimum 1/2-inch- wide flanges, 3/4 inch deep.
      a. Minimum Base-Metal Thickness: Minimum (20 gauge) 0.033 inch or as indicated on Drawings.

E. Contractor option: Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.
   1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide the following:
   1. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.

1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

C. Install bracing at terminations in assemblies.

D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Single-Layer Application: 16 inches o.c. unless otherwise indicated.
2. Multilayer Application: 16 inches o.c. unless otherwise indicated.
3. Tile Backing Panels: 16 inches o.c. unless otherwise indicated.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
C. Install studs so flanges within framing system point in same direction.

D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.

2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
   a. Install two studs at each jamb unless otherwise indicated.
   b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
   c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
   a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.

E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.5 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Hangers: 48 inches o.c.
2. Carrying Channels (Main Runners): 48 inches o.c.
3. Furring Channels (Furring Members): 16 inches o.c.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
   a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
   a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Do not attach hangers to steel roof deck.
5. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.

F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

G. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 09 22 16
SECTION 09 29 00

GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Interior gypsum board.
   2. Texture finishes.
B. Related Requirements:
   1. Section 09 22 16 "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board panels.

1.2 ACTION SUBMITTALS
A. Product Data: For each type of product.
B. Samples: For the following products:
   1. Textured Finishes: Manufacturer's standard size for each textured finish indicated and on same backing indicated for Work.

1.3 DELIVERY, STORAGE AND HANDLING
A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.4 FIELD CONDITIONS
A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Gypsum.
2. CertainTeed Corp.
3. Georgia-Pacific Gypsum LLC.
5. USG Corporation.

B. Gypsum Wallboard: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch.
2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.

C. Gypsum Board, Type X: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch.
2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.


1. Core: 5/8 inch, Type X.
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
E. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.

1. Core: 5/8 inch, Type X.
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.4 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
2. Shapes:
   a. Cornerbead.
   b. LC-Bead: J-shaped; exposed long flange receives joint compound.
   c. L-Bead: L-shaped; exposed long flange receives joint compound.
   d. Expansion (control) joint.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Fry Reglet Corp.
   b. Gordon, Inc.
   c. Pittcon Industries.

2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, Alloy 6063-T5.
3. Shapes as indicated.
4. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

2.5 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.
2. Tile Backing Panels: As recommended by panel manufacturer.
C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping or drying-type, all-purpose compound.
   a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use setting-type, sandable topping drying-type, all-purpose compound.
4. Finish Coat: For third coat, use setting-type, sandable topping drying-type, all-purpose compound.

2.6 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

C. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

D. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Pecora Corporation; AC-20 FTR.
   b. USG Corporation; SHEETROCK Acoustical Sealant.
2.7 TEXTURE FINISHES

A. Primer: As recommended by textured finish manufacturer.

B. Non-Aggregate Finish: Pre-mixed, vinyl texture finish for spray application.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      b. USG Corporation; BEADEX FasTex Wall and Ceiling Spray Texture.
   2. Texture: Orange peel, match texture on existing walls.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.
F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
   1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
   2. Fit gypsum panels around ducts, pipes, and conduits.
   3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:
   1. Gypsum Board, Type X:
      a. Vertical surfaces unless otherwise indicated.
      b. Horizontal surfaces, typical.
      c. Contractor option: Gypsum Board, Type X may be used in lieu of gypsum wallboard.
   2. Abuse-Resistant Gypsum Board (Type X):
      a. Floor to 8'-0" above floor corridors, vestibules, lobbies, waiting areas, storage rooms, and mechanical rooms.
      b. Contractor option: Abuse-Resistant Gypsum Board (Type X) may be used in lieu of Gypsum Board, Type X.
B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.

2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

   a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
   b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.

3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.

2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.

3. Fastening Methods: Fasten base layers with screws; fasten face layers with adhesive and supplementary fasteners.

3.4 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints, according to ASTM C 840 and in specific locations approved by Architect for visual effect.

1. Ceilings:
   a. Install control joints in areas exceeding 2,500 square feet.
   b. Space Control joints not more than 50 feet on center.
   c. Install control joints where ceiling framing changes direction.

2. Partitions and Furring:
   a. Install control joints in partitions and wall furring runs exceeding 30 feet.
b. Space control joints not more than 30 feet on center.
c. Install control joints in furred assemblies where control joints occur in base exterior wall.
d. Install control joints at each side of openings in partitions of dimension greater than 2'-8".

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners unless otherwise indicated.
2. LC-Bead: Use at exposed panel edges.

3.5 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Not used.
3. Level 3: Not used.
4. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
   a. Primer and its application to surfaces are specified in Section 09 91 23 "Interior Painting."
5. Level 5: Not used.

3.6 APPLYING TEXTURE FINISHES

A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.

B. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture free of starved spots or other evidence of thin application or of application patterns.

C. Prevent texture finishes from coming into contact with surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means. If, despite these precautions, texture finishes contact these surfaces, immediately remove droppings and
overspray to prevent damage according to texture-finish manufacturer's written recommendations.

3.7 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 29 00
SECTION 09 51 13
ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY
A. Section includes acoustical panels and exposed suspension systems for ceilings.

1.2 ACTION SUBMITTALS
A. Product Data: For each type of product.
B. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
   1. Acoustical Panel: Set of 6-inch-square Samples of each type, color, pattern, and texture.

1.3 INFORMATIONAL SUBMITTALS
A. Product Test Reports: For each acoustical panel ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency.
B. Evaluation Reports: For each acoustical panel ceiling suspension system, from ICC-ES.

1.4 CLOSEOUT SUBMITTALS
A. Maintenance Data: For finishes to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS
A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Acoustical Ceiling Panels: Full-size panels equal to 5 percent of quantity installed.
   2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.

1.6 DELIVERY, STORAGE, AND HANDLING
A. Deliver acoustical panels, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they
will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.7 FIELD CONDITIONS

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

1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
2. Smoke-Developed Index: 50 or less.

2.2 ACOUSTICAL PANELS, GENERAL

A. Source Limitations:

1. Acoustical Ceiling Panel: Obtain each type from single source from single manufacturer.
2. Suspension System: Obtain each type from single source from single manufacturer.

B. Acoustical Panel Standard: Provide manufacturer’s standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances unless otherwise indicated.

1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface according to ASTM E 795.
2.3 ACOUSTICAL PANELS

A. Products: Refer to Finish Legend.
   1. Match ceiling in existing adjacent spaces, 24 by 48 inches.
   2. Second look ceiling panels as scheduled, 24 by 48 inches.

B. Color: White.

2.4 METAL SUSPENSION SYSTEMS, GENERAL

A. Metal Suspension-System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635/C 635M.

B. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
   2. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304, nonmagnetic.
   3. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch diameter wire.

D. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.

2.5 METAL SUSPENSION SYSTEM

A. Manufacturers: Subject to compliance with requirements, provide products by the following:
   1. Armstrong World Industries, Inc.

B. Wide-Face, Capped, Double-Web, Hot-Dip Galvanized, G60, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; hot-dip galvanized according to ASTM A 653/A 653M, G60 coating designation; with prefinished, cold-rolled, 15/16-inch-wide aluminum caps on flanges.
   1. Prelude XL as manufactured by Armstrong World Industries, Inc.
   3. Face Design: Flat, flush.
4. Face Finish: Match existing.

2.6 METAL EDGE MOLDINGS AND TRIM

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Armstrong World Industries, Inc.

B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard, shadow moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.

1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners unless otherwise indicated.

2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

2.7 ACOUSTICAL SEALANT

A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1. Acoustical Sealant for Exposed and Concealed Joints:

   a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.

B. Acoustical Sealant: Manufacturer's standard sealant complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.


   2. Acoustical sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

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

3.3 INSTALLATION

A. General: Install acoustical panel ceilings to comply with ASTM C636/C636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
6. Do not attach hangers to steel deck tabs.
7. Do not attach hangers to steel roof deck. Attach hangers to structural members.
8. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
9. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.

1. Arrange directionally patterned acoustical panels as follows:
   a. As indicated on reflected ceiling plans.
2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
3. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
4. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions unless otherwise indicated.

3.4 CLEANING

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

END OF SECTION 09 51 13
SECTION 09 65 13
RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Resilient base.
   2. Resilient Accessories.

1.2 ACTION SUBMITTALS
A. Product Data: For each type of product.
   B. Samples for Verification: For each type of product indicated and for each color, texture, and
      pattern required in manufacturer's standard-size Samples.

1.3 MAINTENANCE MATERIAL SUBMITTALS
A. Furnish extra materials that match products installed and that are packaged with protective
   covering for storage and identified with labels describing contents.
   1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each
      type, color, pattern, and size of resilient product installed.

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

1.5 FIELD CONDITIONS
A. Maintain ambient temperatures within range recommended by manufacturer, but not less than
   70 deg F or more than 95 deg F in spaces to receive resilient products during the following time
   periods:
   1. 48 hours before installation.
   2. During installation.
   3. 48 hours after installation.
B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg For more than 95 deg F.

C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 THERMOSET-RUBBER BASE

A. Products: Rubber base as manufactured by Roppe Corporation, USA:
   1. Refer to Finish Legend.

B. Product Standard: ASTM F 1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).
   1. Style and Location:
      a. Style B, Cove: Refer to Drawings for location.

C. Thickness: 0.125 inch.

D. Height: 6 inches.

E. Lengths: Coils in manufacturer's standard length.

F. Outside Corners: Factory formed.

G. Inside Corners: Job formed.

H. Colors: As indicated in the Finish Legend in Drawings.

2.2 RESILIENT MOLDING ACCESSORY

A. Resilient Molding Accessory:
   1. Manufacturers: Same manufacturer as Rubber Base manufacturer.

B. Description: Carpet edge for glue-down applications, Nosing for carpet, and Transition strips.

C. Material: Rubber.

D. Profile and Dimensions: Refer to Finish Legend in Drawings.

E. Colors and Patterns: Match base color for individual space.
2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.
   1. Adhesives shall have a VOC content of 50 g/L or less.

2.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of carpet or resilient floor that would otherwise be exposed.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
   1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

B. Proceed with installation only after unsatisfactory conditions have been corrected.
   1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
C. Do not install resilient products until they are the same temperature as the space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Job-Formed Corners:

1. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.

   a. Miter corners to minimize open joints.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

B. Perform the following operations immediately after completing resilient-product installation:

1. Remove adhesive and other blemishes from exposed surfaces.
C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 09 65 13
SECTION 09 65 19
RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Vinyl composition floor tile.

1.2 ACTION SUBMITTALS
A. Samples: Full-size units of each color and pattern of floor tile required.

1.3 CLOSEOUT SUBMITTALS
A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.4 MAINTENANCE MATERIAL SUBMITTALS
A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Floor Tile: Furnish one box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.5 QUALITY ASSURANCE
A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.

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

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following time periods:
   1.  48 hours before installation.
   2.  During installation.
   3.  48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Close spaces to traffic during floor tile installation.

D. Close spaces to traffic for 48 hours after floor tile installation.

E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 VINYL COMPOSITION FLOOR TILE

A. Products: Armstrong Excelon as manufactured by Armstrong Flooring, Inc.

B. Thickness: 0.125 inch.

C. Size: 12 by 12 inches.

D. Colors and Patterns: As selected.

2.2 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

1. Adhesives shall comply with the following limits for VOC content:
   a. Vinyl Composition Tile Adhesives: 50 g/L or less.

C. Floor Polish: Provide protective, liquid floor-polish products recommended by floor tile manufacturer.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
4. Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:

   a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
   b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install floor tiles until they are the same temperature as the space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.
E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles square with room axis.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

1. Lay tiles with grain direction alternating in adjacent tiles (basket-weave pattern) or in pattern of colors and sizes indicated.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.

G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.

B. Perform the following operations immediately after completing floor tile installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.
C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish: Remove soil, adhesive, and blemishes from floor tile surfaces before applying liquid floor polish.
   1. Apply one coat(s).

E. Cover floor tile until Substantial Completion.

END OF SECTION 09 65 19
SECTION 09 68 13
TILE CARPETING

PART 1 - GENERAL

1.1 SUMMARY
A. Section includes modular carpet tile.
B. Related Requirements:
   1. Section 09 6513 "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet tile.

1.2 ACTION SUBMITTALS
A. Product Data: For each type of product.
   1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
   2. Include manufacturer's written installation recommendations for each type of substrate.
B. Sustainable Design Submittals:
   1. Laboratory Test Reports: For flooring products, indicating compliance with requirements for low-emitting materials.
C. Shop Drawings: For carpet tile installation, plans showing the following:
   1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
   2. Carpet tile type, color, and dye lot.
   3. Type of subfloor.
   4. Type of installation.
   5. Pattern of installation.
   6. Pattern type, location, and direction.
   7. Pile direction.
   8. Type, color, and location of insets and borders.
   9. Type, color, and location of edge, transition, and other accessory strips.
   10. Transition details to other flooring materials.
D. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.


E. Product Schedule: For carpet tile. Use same designations indicated on Drawings.


1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.

C. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:

1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.

2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has successfully completed 5 similar installations.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI's "CRI Carpet Installation Standard."

1.8 FIELD CONDITIONS

A. Comply with CRI's "CRI Carpet Installation Standard" for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

1.9 WARRANTY

A. Special Warranty for Carpet Tiles: 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, the following:

   a. More than 10 percent edge raveling, snags, and runs.
   b. Dimensional instability.
   c. Excess static discharge.
   d. Loss of tuft-bind strength.
   e. Loss of face fiber.
   f. Delamination.

3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE

A. Products: Subject to compliance with requirements, provide the following:

1. Flor as manufactured by Interface.

   a. Color: Refer to Finish Legend.
   b. Pattern: Refer to Finish Legend.
c. Source: Refer to Finish Legend.

B. Antimicrobial Treatment: Manufacturer's standard material.

C. Soil / Stain Protection: Manufacturer's standard material.

D. Sustainable Design Requirements:
   1. Carpet and cushion shall comply with testing and product requirements of CRI's "Green Label Plus" testing program.

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and are recommended by carpet tile manufacturer for releasable installation.
   1. Adhesives shall have a VOC content of 50 g/L or less.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance.

B. Examine carpet tile for type, color, pattern, and potential defects.

C. Concrete Slabs: Verify that finishes comply with requirements specified in Section 03 3000 "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.
   1. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
      a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
      b. Relative Humidity Test: Using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
c. Perform additional moisture tests recommended in writing by adhesive and carpet tile manufacturers. Proceed with installation only after substrates pass testing.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with CRI's "Carpet Installation Standards" and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. 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 instructions.

C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturers.

D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with CRI's "CRI Carpet Installation Standard," Section 18, "Modular Carpet" and with carpet tile manufacturer's written installation instructions.

B. Installation Method: As recommended in writing by carpet tile manufacturer.

C. Maintain dye-lot integrity. Do not mix dye lots in same area.

D. Maintain pile-direction patterns.

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 carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.

H. Install pattern parallel to walls and borders.
3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:
   1. Remove excess adhesive and other surface blemishes using cleaner recommended by carpet tile manufacturer.
   2. Remove yarns that protrude from carpet tile surface.

B. Protect installed carpet tile to comply with CRI's "Carpet Installation Standard," Section 20, "Protecting Indoor Installations."

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 09 68 13
PART 1 - GENERAL

1.1 SUMMARY

A. Section includes surface preparation and the application of paint systems on the following exterior substrates:

1. Concrete masonry units (CMUs).
2. Steel and iron.
4. Aluminum (not anodized or otherwise coated).
5. Wood.

B. Related Requirements:

1. Section 05 1200 "Structural Steel Framing" for shop priming of metal substrates.
2. Section 05 5000 "Metal Fabrications" for shop priming metal fabrications.
3. Section 05 5213 "Pipe and Tube Railings" for shop priming pipe and tube railings.

1.2 DEFINITIONS

A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

D. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

E. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

F. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.
1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.
   1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
   2. Indicate VOC content.

B. Sustainable Design Submittals:
   1. Comply with Section 01 8113.23, Sustainable Design Requirements – LEED for Schools. Complete Material Data Worksheets provided by Owner’s LEED Consultant, and provide manufacturer’s supporting documentation for the following:
      a. Product Data for Credit EQ 4.2: For paints and coatings applied on site within the vapor barrier, documentation including printed statement of VOC content.

C. Samples for Initial Selection: For each type of topcoat product.

D. Samples for Verification: For each type of paint system and each color and gloss of topcoat.
   1. Submit Samples on rigid backing, 8 inches square.
   2. Apply coats on Samples in steps to show each coat required for system.
   3. Label each coat of each Sample.
   4. Label each Sample for location and application area.

E. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:
   1. Exterior Painting: Minimum 3 years experience with similar projects and materials with record of successful installation.
   2. High Performance Coatings: Minimum 5 years experience with similar projects and materials with record of successful installation.
1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
   1. Maintain containers in clean condition, free of foreign materials and residue.
   2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Manufacturer: The Sherwin-Williams Company, Provide products manufactured by The Sherwin-Williams Company or one of the following:
   1. Approved equal.

2.2 PAINT, GENERAL

A. Material Compatibility:
   1. Materials for use within each paint system shall be 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, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

B. VOC Content: For field applications, paints and coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
   1. Flat Paints and Coatings: 50 g/L.
   2. Nonflat Paints and Coatings: 50 g/L.
   3. Dry-Fog Coatings: 150 g/L.
   4. Primers, Sealers, and Undercoaters: 100 g/L.
   5. Rust-Preventive Coatings: 100 g/L.
   6. Zinc-Rich Industrial Maintenance Primers: 100 g/L.
   7. Pretreatment Wash Primers: 420 g/L.
   8. Shellacs, Clear: 730 g/L.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
   1. Masonry (Clay and CMUs): 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

D. Proceed with coating application only after unsatisfactory conditions have been corrected.
   1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
   1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
   1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.

E. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer.

9. Shellacs, Pigmented: 550 g/L.

C. Colors: As selected by Architect from manufacturer's full range.
F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

H. Aluminum Substrates: Remove loose surface oxidation.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
4. Paint entire exposed surface of window frames and sashes.
5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed to view:
   a. Equipment, including panelboards.
   b. Uninsulated metal piping.
   c. Uninsulated plastic piping.
   d. Pipe hangers and supports.
   e. Metal conduit.
   f. Plastic conduit.
   g. Tanks that do not have factory-applied final finishes.
3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

A. Steel and Iron Substrates:

1. Water-Based Light Industrial Coating System:
   a. Prime Coat: Primer, acrylic, anti-corrosive for metal.
      1) Sherwin-Williams, Pro Industrial Pro-Cryl Universal Metal Primer, B66-310.
   c. Topcoat: Light industrial coating, exterior, water based, semi-gloss (Gloss Level 5).

B. Galvanized-Metal Substrates:

1. Water-Based Light Industrial Coating System:
   a. Prime Coat: Primer, acrylic, anti-corrosive for metal.
1) Sherwin-Williams, Pro Industrial, Pro-Cryl Universal Metal Primer, B66-310.

   a. Topcoat: Light industrial coating, exterior, water based, semi-gloss (Gloss Level 5).

C. Aluminum Substrates:

1. Water-Based Light Industrial Coating System:
   a. Prime Coat: Primer, acrylic, anti-corrosive for metal.
      1) Sherwin-Williams, Pro Industrial, Pro-Cryl Universal Metal Primer, B66-310.
   c. Topcoat: Light industrial coating, exterior, water based, semi-gloss (Gloss Level 5).

D. Wood Substrates.

1. Architectural Latex System:
      1) Sherwin-Williams, Multi-Purpose, Zero VOC Primer/Sealer, B51W00450.
   c. Topcoat: Latex, exterior flat (Gloss Level 1).
      1) Sherwin-Williams, A-100 Exterior Latex Flat, A6 series.
   d. Topcoat: Latex, exterior, satin (Gloss Level 3-4).
      1) Sherwin-Williams, A-100 Exterior Latex Satin, A82 series.
   e. Topcoat: Latex, exterior semi-gloss (Gloss Level 5).
      1) Sherwin-Williams, A-100, Exterior Latex Gloss, A08W00150.
   f. Topcoat: Latex, exterior gloss (Gloss Level 5-6).


END OF SECTION 09 91 13
PART 1 - GENERAL

1.1 SUMMARY

A. Section includes surface preparation and the application of paint systems on the following interior substrates:

1. Concrete.
2. Steel and iron.
4. Aluminum (not anodized or otherwise coated).
5. Wood.

B. Related Requirements:

1. Section 03 3519 “Concrete Staining” for requirements for concrete scheduled to be stained.
2. Section 05 1200 "Structural Steel Framing" for shop priming structural steel.
3. Section 05 5000 "Metal Fabrications" for shop priming metal fabrications.
4. Section 05 5213 "Pipe and Tube Railings" for shop priming pipe and tube railings.

1.2 DEFINITIONS

A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

D. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

E. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

F. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

G. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.
1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.
   1. Indicate VOC content.

B. Sustainable Design Submittals:
   1. Laboratory Test Reports: For paints and coatings, indicating compliance with requirements for low-emitting materials.

C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
   1. Submit Samples on rigid backing, 8 inches square.
   2. Apply coats on Samples in steps to show each coat required for system.
   3. Label each coat of each Sample.
   4. Label each Sample for location and application area.

D. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:
   1. Interior Painting: Minimum 3 years experience with similar projects and materials with record of successful installation.
   2. High Performance Coatings: Minimum 5 years experience with similar projects and materials with record of successful installation.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
   1. Maintain containers in clean condition, free of foreign materials and residue.
   2. Remove rags and waste from storage areas daily.
1.7 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 degrees F.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 degrees F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design Manufacturer: The Sherwin-Williams Company, Provide products manufactured by The Sherwin-Williams Company or one of the following:

1. Approved equal.

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Materials for use within each paint system shall be 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, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

B. VOC Content: For field applications that are inside the weatherproofing system, paints and coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:

1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 150 g/L.
3. Dry-Fog Coatings: 400 g/L.
4. Primers, Sealers, and Undercoaters: 200 g/L.
5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
7. Pretreatment Wash Primers: 420 g/L.
8. Shellacs, Clear: 730 g/L.
9. Shellacs, Pigmented: 550 g/L.

C. Colors: Refer to Finish Legend and Finish Schedule.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
   1. Concrete: 12 percent.
   2. Wood: 15 percent.
   3. Gypsum Board: 12 percent.

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.

E. Proceed with coating application only after unsatisfactory conditions have been corrected.
   1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
   1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
   1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer.
F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

H. Aluminum Substrates: Remove loose surface oxidation.

I. Wood Substrates:
   1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
   2. Sand surfaces that will be exposed to view, and dust off.
   3. Prime edges, ends, faces, undersides, and backsides of wood.
   4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
   1. Use applicators and techniques suited for paint and substrate indicated.
   2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
   3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
   4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
   5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed in equipment rooms:
   a. Equipment, including panelboards.
   b. Uninsulated metal piping.
   c. Uninsulated plastic piping.
   d. Pipe hangers and supports.
   e. Metal conduit.
   f. Plastic conduit.
   g. Tanks that do not have factory-applied final finishes.

2. Paint the following work where exposed in occupied spaces:
   a. Equipment, including panelboards.
   b. Uninsulated metal piping.
   c. Uninsulated plastic piping.
   d. Pipe hangers and supports.
   e. Metal conduit.
   f. Plastic conduit.
   g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
   h. Other items as directed by Architect.

3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

   1. Contractor shall touch up and restore painted surfaces damaged by testing.
   2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
C. Protect work of other trades against damage from paint application. Correct damage to work of
other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and
leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or
defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

A. Steel Substrates:

1. Epoxy System:
   a. Prime Coat: Primer, alkyd, anti-corrosive, for metal.
      1) Sherwin-Williams, Pro Industrial Pro-Cryl Universal Primer, B66-310
         series.
   b. Intermediate Coat: Pre-Catalyzed Water Based Epoxy, matching topcoat.
   c. Topcoat: Latex, interior, high performance architectural, semi-gloss (Gloss
      Level 5).
      1) Sherwin-Williams, Pro Industrial Pre-Catalyzed Water Based Epoxy, Semi-
         Gloss, K46-051.

B. Galvanized-Metal Substrates:

1. Epoxy System:
   a. Prime Coat: Primer, galvanized, water based.
      1) Sherwin-Williams, Pro Industrial Pro-Cryl Universal Primer, B66-310
         series.
   b. Intermediate Coat: Pre-Catalyzed Water Based Epoxy, matching topcoat.
   c. Topcoat: Latex, interior, high performance architectural, semi-gloss (Gloss
      Level 5).
      1) Sherwin-Williams, Pro Industrial Pre-Catalyzed Water Based Epoxy, Semi-
         Gloss, K46-051.

C. Aluminum (Not Anodized or Otherwise Coated) Substrates:

1. Epoxy System:
   a. Prime Coat: Primer, quick dry, for aluminum.
      1) Sherwin-Williams, Pro Industrial Pro-Cryl Universal Primer, B66-310
         series.
   b. Intermediate Coat: Pre-Catalyzed Water Based Epoxy, matching topcoat.
c. Topcoat: Latex, interior, high performance architectural, semi-gloss (Gloss Level 5).
   1) Sherwin-Williams, Pro Industrial Pre-Catalyzed Water Based Epoxy, Semi-Gloss, K46-051.

D. Wood Substrates.

1. Wood, Clear Finish:
   b. Clear Semi-Gloss:
      1) First coat: (Alkyd Resin) McCloskey Heirloom Sanding Sealer 6200.

E. Gypsum Board Substrates:

1. Architectural Latex System:
      1) Sherwin-Williams, ProMar 200 Zero VOC Interior Latex Primer, B28W2600.
   c. Topcoat: Latex, interior, high performance architectural, egg-shell (Gloss Level 3).
      1) Sherwin-Williams, ProMar 400 Interior Latex Eg-Shel, B20W4400.
      2) Location: Typical, except as noted in paragraph 3.6.G.1.d below.
   d. Topcoat: Latex, interior, high performance architectural, semi-gloss (Gloss Level 5).
      1) Sherwin-Williams, ProMar 400 Interior Latex Semi-Gloss, B31W4400.

END OF SECTION 09 91 23
PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Resilient entrance mats.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for floor mats and frames.

B. Samples for Initial Selection: For each type of product indicated.

C. Samples for Verification: For the following products, in manufacturer's standard sizes:
   1. Resilient entrance mats: full tile.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance Data: For floor mats and frames to include in maintenance manuals.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Resilient-Tile Entrance Mats: Full-size tile units equal to 2 percent of amount installed, but no fewer than 10 units.

PART 2 - PRODUCTS

2.1 ENTRANCE FLOOR MATS AND FRAMES, GENERAL

A. Accessibility Standard: Comply with applicable provisions in the DOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1 Insert regulation.
B. Source Limitation: Obtain floor mats through one source from a single manufacturer.

2.2 RESILIENT-TILE ENTRANCE MATS

A. Carpet-Type Tiles: Refer to Finish Legend, nonraveling edges.
   1. Colors, Textures, and Patterns: Refer to Finish Legend.
   2. Tile Size: As indicated.

2.3 FRAMES

A. No frame, tooled concrete edge at slab recess.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and floor conditions for compliance with requirements for location, sizes, minimum recess depth, and other conditions affecting installation of floor mats and frames.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PROTECTION

A. After completing concrete work, provide temporary filler of plywood or fiberboard in recesses and cover opening with plywood protective flooring. Protect tooled edges. Maintain protection until construction traffic has ended and Project is near Substantial Completion.

END OF SECTION 12 48 13
PART 1 - GENERAL

1.1 SCOPE OF WORK

A. See General Conditions and Supplemental General Conditions.

B. The requirements listed under General Conditions and Supplemental General Conditions and the General Requirements are applicable to this Section and all subsequent sections of this Division and form a part of the contract.

1.2 INDEX OF SPEC SECTIONS FOR THIS DIVISION

<table>
<thead>
<tr>
<th>Section</th>
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<tr>
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<tr>
<td>23 3000</td>
<td>Air Tempering System and Equipment</td>
</tr>
</tbody>
</table>

1.3 DEFINITIONS

A. General: Terms will have meanings as defined in Webster’s Eleventh New Collegiate Dictionary except as noted below.

B. Entities

1. Owner: Rio Rancho Public Schools
3. Engineer: Bridgers & Paxton
4. Owner's Representative: The Owner will designate his representative after bid. The abbreviation “OR” may be used throughout these specifications to refer to the Owner’s Representative.
5. Owner's Agents: The Architect, Engineer, and others authorized to act on behalf of the Owner.

C. Actions

1. Supply: Procure and deliver to the site with all features as specified, required per code, and as required for proper installation. Include submittals, O&M manuals, operator instructions, and warranty.
2. Install: Set in place in accordance with manufacturer's instructions, contract documents, and applicable codes and standards. Coordinate the installation with other disciplines, start, and demonstrate proper operation.
3. Furnish: Supply and install.
5. Accepted: By the Owner’s Representative except as noted.
6. Approved: By the Owner’s Representative except as noted.
7. Review: By the Engineer except as noted.

D. Locations

1. Buried: Surrounded by soil or other material, either beneath the building or exterior to the building.
2. Exterior: Exposed to rain or snow. Examples include rooftop locations, spaces around cooling towers, pipe racks, etc.
3. Interior: Not exterior or buried. Examples include not only spaces within the heated envelope of the building, but also unheated attics, covered loading docks in which spaces are protected from rain and snow, utility tunnels, sheds, etc.
4. Finished Spaces: Interior spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated attics, spaces above ceilings, crawlspace, and tunnels.
5. Exposed: Exposed to view. Examples include finished spaces mechanical equipment rooms, rooftops, etc.

E. Other Definitions:

1. 24/7: 24 Hr/day, 7 days per week, year-round.
2. AHJ: Authorities having jurisdiction. The authorities having jurisdiction over this project are established by statute, and include governmentally designated building departments, the fire marshal, fire departments, etc. No attempt is made to list all such entities here; a qualified Contractor is expected to know and coordinate with the various authorities having jurisdiction.
3. FMS: Facility Management System
4. Local: Based no further from the job site than the Engineer is. For example, where the specifications call for a local factory authorized service agent, then on a daily basis that agent must be based in an office or warehouse located no further from the project site than the Engineer’s office.
5. OAE: Or approved equal.

1.4 CODES AND PERMITS

A. Perform all work in accordance with the 2009 International Building Code, the 2012 Uniform Plumbing Code, and the 2012 Uniform Mechanical Code, as adopted and interpreted by the State of New Mexico and City of Rio Rancho, and the National Fire Protection Association (NFPA Regulations), current adopted edition. Provide all materials and labor necessary to comply with rules, regulations and ordinances. Where the drawings and/or specifications indicate materials or construction in excess of code requirements, the drawings and/or specifications shall govern. Contractor shall hold and save the Owner and his agents free and harmless from liability of any nature or kind arising from the Contractor’s failure to comply with codes and ordinances.
B. Secure and pay for all permits necessary for performance of the work, including utility connections, extensions, meter pits and meter sets and tap fees for water, storm sewer, sanitary sewer and natural gas, unless otherwise specified herein.

C. Comply with the requirements of, and the recommendations of:

1. Applicable county and state mechanical, electrical, gas, plumbing, health and sanitary codes, laws and ordinances
2. National Electrical Manufacturer’s Association
3. National Electrical Code
4. Underwriters Laboratories
5. American National Standards Institute
6. American Society for Testing Materials
7. Local utility companies
8. National Fire Protection Association
9. ASME Boiler and Pressure Vessel Codes
10. Occupational Safety and Health Administration
11. International Fire Code
12. Midwest Insulation Contractors’ Association (MICA)
13. Sheet Metal and Air Conditioning Contractors’ National Association (SMACNA)
15. American Gas Association

1.5 DOCUMENT MANAGEMENT

A. Contractor is encouraged to use a web-based document management system for RFIs and submittals. If used, Contractor shall provide and pay for licenses and training for the engineer’s project personnel. The section below describes procedures for handling submittals if a web-based document management system is not used. If a web-based system is used, the procedures below shall be modified as appropriate.

1.6 SUBMITTALS

A. See Division 1

B. Review of Submittals: Engineer will review submittals for general conformance with the design intent.

1. Review of a separate item as such will not indicate review of the assembly in which the item functions.
2. Review of submittals shall not relieve the Contractor of responsibility for any deviation from the requirements of the Contract Documents, nor for errors or omissions in the submittals; or for the accuracy of dimensions, the adequacy of connections, and the proper and acceptable fitting, execution, functioning and completion of the work.
3. Review will not relieve the Contractor of responsibility to comply with the contract requirements, or responsibility to ensure that equipment fits within the allotted space with required clearances for equipment operation, service and maintenance, including minimum clearances required by applicable codes, manufacturer's installation instructions and as necessary for proper clearance in front of all electrical panels as defined by the National Electric Code (NEC).

4. For commodity type items (plumbing fixtures, terminal units, registers, diffusers, etc), Engineer will review submittals for type only. Contractor to coordinate sizes and quantities.

5. Actions: Engineer will return submittals with one of the following actions:

   - **NO EXCEPTIONS TAKEN**: Contractor may proceed with the work as submitted.
   - **EXCEPTIONS AS NOTED**: Contractor may proceed with the work and without resubmittal provided he complies with all exceptions noted in the submittal, and so states in a letter.
   - **REVISE AND RESUBMIT**: Resubmit in accordance with the indicated comments.
   - **REJECTED**: Resubmit in accordance with the contract documents.
   - **RETURNED WITHOUT ACTION**: This submittal has not been reviewed, and therefore the Engineer is returning it with no direction to the Contractor.

C. Substitutions:

1. Unauthorized Substitutions: If substitute materials, equipment or systems are installed without prior review or if any work is installed in a manner which is not in conformance with the requirements of this specification and for which the Contractor has not received written authorization, remove such unauthorized work and install work in accordance with the contract documents at no change in contract amount.

2. Authorized Substitutions: Provide all accessories and features as required and coordinate substitutions with other disciplines. Bear any extra expenses resulting from the use of substitutions which affect adjoining or related work required in this division or other divisions of the work.

3. If the Contractor substitutes equipment for that indicated on the drawings, he shall prepare a 1/4 inch = 1 foot installation drawing for each equipment room where a substitution is made, using dimensions of substituted equipment, and including piping, and electrical equipment requirements, to verify that equipment will properly fit within the space with adequate clearance for maintenance and replacement. Submit this drawing for review.

D. Schedule: Submit all submittals in a timely manner consistent with the requirements for completing the work covered by this contract within the prescribed contract time. Be aware that there is risk in ordering components, fabricating work, and/or installing work prior to review. If the Contractor proceeds prior to review, and then the review comments required modifications to work which has begun or has been completed, then Contractor must comply with the review comments at no change in contract amount or schedule.
E. Shop Drawings

1. Submit shop drawings for
   a. Mechanical equipment rooms and other spaces housing air handling equipment, heat transfer equipment, fluid handling equipment, machinery, etc.
   b. Complete supply, return, and exhaust ductwork systems, both exposed and concealed.
   c. Piping for HVAC, plumbing, and fire protection systems, both exposed and concealed.

2. Show the location and elevation of all equipment, ductwork and piping, as well as openings through slabs and walls. Include plans, elevations and sections as appropriate. Clearly show the manner in which the systems fit into the available space and relate to each other and to the building elements. Indicate required sleeves and openings in general construction elements. Indicate required clearances for operation, maintenance and replacement of operating devices and equipment. Drawings shall be of appropriate scale to facilitate coordination and understanding, but not smaller than 1/4 inch scale for floor plans and 1/4 inch scale for equipment rooms and chases.

3. Conflicts: The engineer has endeavored to work out conflicts in areas where the design is congested, but has not tried to show all required offsets to coordinate with the building construction and building systems, particularly in less congested areas. The intent is that the Contractor coordinate the design of the piping and ductwork distribution systems with the building construction and the various building systems, particularly in less congested areas. Provide experienced designers to perform such services and prepare shop drawings. Exercise good design practice in working out conflicts without compromising system operation or maintenance. Provide fittings, offsets, etc., as required. Contractor shall include this design effort and include the labor and materials for such fittings and offsets in his base bid. Except in extremely unusual circumstances, no additional costs will be allowed related to working out conflicts. Coordinate with other disciplines as required. Identify on the shop drawings those areas where redesign was necessary to resolve design conflicts.

   a. In the event that the Contractor desires direction in resolving a design conflict or desires prior approval of a recommended approach to resolving a conflict, submit an RFI which identifies the conflict and suggests a recommended solution.
   b. In resolving conflicts, gravity lines and larger distribution mains will generally have priority over pressurized lines and smaller lines as follows:

   Plumbing waste and vent lines
   Roof drains
   Steam and condensate piping
   Supply, return and exhaust ductwork
   Fire sprinkler mains
   Heating hot water and chilled water piping
   Domestic hot and cold water
   Fire sprinkler branch piping and sprinkler runouts
   Pneumatic control piping
   Miscellaneous special piping systems
4. Use of Engineer’s CADD Database or BIM Model: The Engineer will provide the Contractor electronic files of the Engineer’s CADD Database or BIM Model of the design documents if the Contractor completes and submits the License Agreement form included at the end of this spec section. These files show the general design intent and may be used as a starting point for the Contractor to begin his shop drawings and coordination effort, but the Contractor should not use them as a basis for ordering or fabrication. The normal submittal process still applies, regardless whether the Contractor elects to use the Engineer’s CADD Database or BIM Model.

F. Submittals Required under this Specification Section:

1. Electrical Components: Motors, Motor Controllers, and Variable Speed Drives
2. Identification: Products used to identify equipment, ductwork, valves, piping, and control devices.

1.7 DOCUMENTED COORDINATION EFFORT

A. After shop drawings are reviewed, incorporate any review comments and then participate in a formal and documented coordination effort with the contractors and subcontractors for other divisions of the work. Show all piping systems and equipment on the ductwork drawings, and send electronic CADD files to the General Contractor and the subcontractors for plumbing, fire protection, electrical, and other disciplines. The other subcontractors will then add their work to the CADD files.

B. Make full-size plots of the drawings. Participate in meetings with the GC and other subcontractors to review each area, identify conflicts, and resolve conflicts. Submit the resolutions to the Engineer for review. Maintain adequate space for operation, maintenance, and code-required clearances. Ensure that all subcontractors initial each plan to indicate that they have participated in the coordination effort.

1.8 MISCELLANEOUS PROVISIONS

A. Qualifications

1. All mechanics shall be skilled in their respective trade.
2. All welders shall be certified in accordance with the ASME Boiler Test Code, Section IX, latest issue.

B. Regulated Materials: Comply with all state, local and federal regulations regarding the storage, handling or disposal of oils, lubricants, cleaning agents, refrigerants, other liquids and gases, and hazardous materials.
C. Factory Identification: Provide all materials and equipment with labels sufficient to show compliance with these specifications and the performance requirements indicated on the drawings. All equipment shall carry a permanent label installed by the manufacturer stating that the equipment complies with ASHRAE/IESNA Std. 90.1.

D. Hazardous Conditions: Protruding metal (bolts, steel angles, etc.) potentially hazardous to maintenance and operation personnel, shall be cut back and/or protected to reduce the risk of injury.

E. Hazard Signs
   1. Provide a sign reading, "Hazardous Area - Authorized Personnel Only" on the doors to all equipment rooms, fan plenums, and similar areas containing moving or rotating parts, or other potentially hazardous environments.
   2. Provide a sign reading, "Confined Space - Entry by authorized personnel only by permit" for all confined spaces. Confined spaces shall be as designated by OSHA Standard 1910.146. This generally means a space that:
      a. Is large enough and so configured that an employee can bodily enter and perform assigned work; and
      b. Has limited or restricted means for entry or exit (for example, tanks, vessels, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry); and
      c. Is not designed for continuous employee occupancy.
   3. Survey the final premises to determine where any potentially hazardous areas exist. If the Contractor feels that hazards exist which cannot be suitably provided for through the above typical methods, he shall forward in writing his concerns, and request for a decision concerning the referenced hazard, prior to the final inspection of the facilities.

1.9 GUARANTEE-WARRANTY

A. See Division 1 for additional information on warranties. Warranties shall run for two years from substantial completion unless indicated otherwise.

B. The following warranty shall be binding:

   "The Contractor warrants that this installation is free from mechanical defects. Contractor agrees to replace or repair any part of the installation which may fail within a period of one year after the date established below, provided that such failure is due to defects in materials or workmanship, or to failure to follow the specifications and drawings. This warranty shall begin on the date set forth in the Certificate of Substantial Completion, AIA Form G704, or other such date as documented in writing by the Owner's Representative."

C. The extent of guarantees or warranties by equipment and/or materials manufacturers will not diminish the requirements of the Contractor's warranty to the Owner.
PART 2 - PRODUCTS

2.1 PRODUCT GENERAL REQUIREMENTS

A. General: Products supplied under Division 23 shall comply with the following except as noted elsewhere.

B. Products shall be new; shall be the product of manufacturers regularly engaged in the production of plumbing, heating, ventilating, air conditioning, and control system equipment; and shall be the manufacturer's latest design. Specs and equipment schedules establish expectations regarding standard of quality and operating intent.

C. Hazardous or Environmentally Damaging Materials: Products shall not contain asbestos, mercury, PCBs, or other materials harmful to people or the environment.

D. Products shall be suitable for the conditions under which they are installed and operated. Prior to or during the submittal phase advise the Owner’s representative and the Engineer in writing regarding any concerns about the suitability of the specified products for the intended application or service. Request clarification if any question exists regarding the design intent.

E. Performance Ratings: Unless otherwise noted, all scheduled equipment performance is based on an elevation of 5,300 feet above sea level. Adjust manufacturer's ratings accordingly.

F. Structural Soundness: Products shall have structural integrity appropriate to the component and its application. Bases shall be rigid and shall keep all components in proper alignment. Structural integrity shall be adequate for both rigging and final installation. Components shall not be loose, rattle, or vibrate unnecessarily in their final installed condition.

G. Corrosion Resistance: Equipment shall be of materials inherently corrosion resistant, or shall be finished with a corrosion-resistant finish suitable for the location in which the equipment is installed.

H. Touch-up: If the factory finish of any component is damaged prior to substantial completion, touch up to original condition per manufacturer’s recommendations.

I. Equipment Access Doors or Panels: Provide access doors and panels within equipment to ensure good access to all components requiring inspection, service or maintenance. Provide appropriate hardware. Equipment installed outdoors shall be weather-tight.

J. Fans: Statically and dynamically balanced, shaft first critical speed shall be above operating speed at design conditions.

K. Bearings: Grease lubricated or permanently lubricated.
L. V-Belt Drives: All components sized for 150% of motor HP, multiple belts shall be matched, fixed sheaves for motors 20 Hp and larger, adjustable sheaves for lower HP motors, all safety components for OSHA compliance (e.g., belt guard or other safety provisions) motor mounted on adjustable base. Provide a replacement sheave for each fixed sheave after T&B is complete. Include belt data in O&M manual. Gates Rubber Co, OAE.

1. Belt Guards: Rigidly constructed and attached, removable, galvanized steel, expanded mesh. Design to provide ready access to bearings.

M. Couplings: Provide coupling guard.

N. Motors and VFDs: See requirements described elsewhere in this spec section.

O. Drive Lines (starter or VFD, motor, coupling and shaft or v-belt drive and pulleys, and driven equipment): Coordinate with all suppliers and ensure all components are compatible to work as a system.

P. Coils: ARI rated, copper tubes mechanically expanded into aluminum fins, galvanized steel casing, drainable, pressure tested to 150% of working pressure but not less than 300 psi.

Q. Cooling Coil Drain Pans: Provide for all cooling coils, galvanized or stainless steel, double pitched with piped outlet. For units with more than one coil stacked, provide intermediate drain pans piped to the main drain pan.

R. Gas Burners: Natural gas fired, performance based on gas at 1000 Btu/SCF HHV but suitable for use with gas at 900 – 1050 Btu/SCF and 7 – 11 inches water column, factory installed and pressure tested gas train, all necessary safety and operating controls.

S. Filter Frames: Galvanized steel, provide wherever filters are specified.

T. Roof Curbs and Support Rails for Roof-Mounted Equipment: Roof curbs should generally be supplied with the equipment which the curb supports, and shall comply with the requirements of the National Roofing Contractors’ Association. Match curb to the requirements of the supported equipment. The roof pitch is indicated on the architectural drawings. If roof pitch exceeds the recommendations of the equipment manufacturer, provide a curb that will level the equipment. Factory fabricated, minimum 12-inch, structurally adequate for the load supported, not less than welded 18-gauge (16-gauge or heavier for sizes more than 50-inches) galvanized steel with minimum 1-inch fiberglass insulation, 2 x 2 wood nailer, and with cant and step if required to match specified roof. Provide damper tray for un-ducted fan applications. Ship small curbs fully assembled; large curbs may be knocked down for shipment.

U. Electrical & Controls: Except where specifically noted, electric service to each component listed on the equipment schedules will be through a single electrical feed at the voltage indicated on the equipment schedules. Include all components, cabling and conduits to distribute power to all components which are factory supplied and mounted. Provide transformer(s) if required to serve unit-mounted components requiring electric service at voltages different from the main electric service, including controls components. Provide
secondary overcurrent protection. Provide terminal strips for field-installed control wiring. Provide unit-mounted, unit-specific wiring diagrams on durable paper, attached to inside of control panel door or otherwise affixed to the unit. All electrical components shall be UL Listed or Recognized. All factory-installed electrical work shall comply with the NEC unless the overall unit is listed by an organization acceptable to the AHJ, and listed to a standard acceptable to the AHJ.

1. Where equipment includes an LCD or other, similar display for operator interface, display all information in English. Displays should be readily understandable and should not require the user to look up display codes in a reference manual.
2. Provide battery backup to retain all memory and programming, and to keep all clock-related functions powered through a 1-week power outage.
3. Controls interface with the FMS:
   a. Digital Inputs to FMS: 24V DC sourced from equipment.
   b. Digital Outputs from FMS: Equipment to have form C relays, max 250V DC, 2 A.
   c. Analog Inputs to FMS: 4-20 mA, 0-5V DC, or 0-10V DC sourced from equipment.
   d. Analog Outputs from FMS: 4-20 mA sourced from FMS.

2.2 ELECTRICAL COMPONENTS

A. General: Except as noted, all electrical products and equipment shall comply with the requirements of this section, whether field installed or factory installed. See “Product General Requirements” and “Installation General Requirements” in Parts 2 & 3 of this spec section for additional requirements.

2.3 ELECTRICAL WIRING AND CONTROL EQUIPMENT

A. Provide wiring and conduit as scheduled in Section 23 0549.

B. Coordinate with all disciplines to ensure that all necessary components of control work are included and fully understood.

2.4 IDENTIFICATION

A. Scope: Identify all equipment, ductwork, valves, piping, and control devices shown on the Drawings, identified in the equipment schedules, and indicated in these Specifications. Provide submittals for products and procedures used for identification.

B. Equipment: For all mechanical equipment supplied or installed under Division 23, provide an equipment identification tag or stencil unit number onto the equipment. Stencils shall be minimum 3-inch height, dark contrasting color, of a material suitable for the application.

1. For rooftop HVAC equipment, provide a permanently affixed, weather-resistant label to identify the areas served.
C. Valves: Provide each valve with a stamped metal tag secured to the valve. Tag shall indicate the valve number, service and function. Provide two sets of prints of drawings showing floor plan for each floor with all valves accurately located and labeled. Drawings shall be neat and easily readable. Provide a typed valve chart, listing the valve number, size, location, function, normal operating position, for each valve. List valves by system, i.e., domestic cold water, hot water, chilled water, etc. Tags shall be stamped brass 1-1/2” diameter, and secured to valves by heavy copper figure eight hooks, braided stainless steel wire anchor, or other approved means.

D. Ductwork: Identify ductwork at or near the fan with stenciled signs on insulated ductwork or engraved laminated plastic signs secured by rustproof screws on un-insulated ductwork. Sign shall identify air conditioning system or fan unit and area served.

E. Piping

1. Provide color-coded pipe labels indicating the service of the pipe and the direction of flow. Piping labels shall comply with ANSI Standard A13.1 regarding color coding and size of lettering. The following standardized color code scheme shall be used:

   c. Blue - Gaseous Materials of Inherently Low Hazard.

2. Labels shall be semi-rigid plastic identification markers. Labels shall "span-on" around pipe without the requirement for adhesive or bonding of piping sizes 3/4 inch through 5 inches. Labels for piping 6 inches and larger shall be furnished with spring attachment at each end of label. "SETMARK" Type SNA, 3/4 inch through 5 inch size and Type STR, 6 inches and larger, as manufactured by Seton Name Plate Corporation, Brady, or equivalent.

3. Labels shall be vinyl material with permanent adhesive for application to clear dry pipe and/or insulation jacketing. Pressure sensitive pipe tape matching the background color of the label shall be placed over each end of the label and completely around the pipe.

4. For retrofit projects the system names shall match existing.

5. Attach pipe markers to lower quarter of the pipe on overhead horizontal runs and on the centerline of vertical piping where view is not obstructed.
6. Provide the following labels, with ANSI/OSHA color and banding for all piping systems as shown on the Drawings and as listed below:

<table>
<thead>
<tr>
<th>Service/Legend</th>
<th>Letter Color</th>
<th>Background Color</th>
<th>Tape Banding Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic Cold Water</td>
<td>White</td>
<td>Green</td>
<td>2&quot; Green</td>
</tr>
<tr>
<td>Domestic Hot Water</td>
<td>Black</td>
<td>Yellow</td>
<td>2&quot; Yellow</td>
</tr>
<tr>
<td>Domestic Hot Water Return</td>
<td>Black</td>
<td>Yellow</td>
<td>2&quot; Yellow</td>
</tr>
<tr>
<td>Soft Cold Water</td>
<td>White</td>
<td>Green</td>
<td>2&quot; Green</td>
</tr>
<tr>
<td>Soft Hot Water</td>
<td>Black</td>
<td>Yellow</td>
<td>2&quot; Yellow</td>
</tr>
<tr>
<td>Industrial Cold Water</td>
<td>White</td>
<td>Green</td>
<td>2&quot; Green</td>
</tr>
<tr>
<td>Fire Protection Water</td>
<td>White</td>
<td>Red</td>
<td>2&quot; Red</td>
</tr>
<tr>
<td>Fire Auto Sprinkler</td>
<td>White</td>
<td>Red</td>
<td>2&quot; Red</td>
</tr>
<tr>
<td>Fire Dry Standpipe</td>
<td>White</td>
<td>Red</td>
<td>2&quot; Red</td>
</tr>
<tr>
<td>Fire Wet Standpipe</td>
<td>White</td>
<td>Red</td>
<td>2&quot; Red</td>
</tr>
<tr>
<td>Fire Comb. Standpipe</td>
<td>White</td>
<td>Red</td>
<td>2&quot; Red</td>
</tr>
<tr>
<td>Compressed Air</td>
<td>White</td>
<td>Blue</td>
<td>2&quot; Blue</td>
</tr>
<tr>
<td>Roof Drain</td>
<td>White</td>
<td>Green</td>
<td>2&quot; Green</td>
</tr>
<tr>
<td>Sanitary Sewer</td>
<td>White</td>
<td>Green</td>
<td>2&quot; Green</td>
</tr>
<tr>
<td>Storm Sewer</td>
<td>White</td>
<td>Green</td>
<td>2&quot; Green</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>Black</td>
<td>Yellow</td>
<td>2&quot; Black</td>
</tr>
<tr>
<td>Steam, PSIG</td>
<td>Black</td>
<td>Yellow</td>
<td>2&quot; Black</td>
</tr>
<tr>
<td>Condensate Return, Gravity</td>
<td>Black</td>
<td>Yellow</td>
<td>2&quot; Black</td>
</tr>
<tr>
<td>Condensate Return, Pumped</td>
<td>Black</td>
<td>Yellow</td>
<td>2&quot; Black</td>
</tr>
<tr>
<td>Boiler Feed Water</td>
<td>Black</td>
<td>Yellow</td>
<td>2&quot; Black</td>
</tr>
<tr>
<td>Chilled Water Supply</td>
<td>White</td>
<td>Green</td>
<td>2&quot; Green</td>
</tr>
<tr>
<td>Chilled Water Return</td>
<td>White</td>
<td>Green</td>
<td>2&quot; Green</td>
</tr>
<tr>
<td>Heating Water Supply</td>
<td>Black</td>
<td>Yellow</td>
<td>2&quot; Yellow</td>
</tr>
<tr>
<td>Heating Water Return</td>
<td>Black</td>
<td>Yellow</td>
<td>2&quot; Yellow</td>
</tr>
<tr>
<td>Condensing Water Supply</td>
<td>White</td>
<td>Green</td>
<td>2&quot; Green</td>
</tr>
<tr>
<td>Condensing Water Return</td>
<td>White</td>
<td>Green</td>
<td>2&quot; Green</td>
</tr>
</tbody>
</table>

7. Locations: Label pipes at the following points on each piping system:
   a. Adjacent to each valve in piping system.
   b. At every point of entry and exit where piping passes through a wall.
c. On each pipe riser and junction.
d. At a maximum interval of 20 feet on pipe lines exposed and concealed above accessible ceilings.
e. Adjacent to all special fittings (regulating valves, etc.) in piping systems.
f. At every access door.

8. Underground Piping: Provide a continuous, preprinted, bright colored, plastic ribbon cable marker with each underground pipe regardless of whether encased. Locate directly over buried pipe, 6 inches to 8 inches below finished grade. Marker tape used in conjunction with buried plastic piping systems shall be special detector type.

F. Control System Devices: All automatic controls, control panels, zone valves, pressure electric, electric pressure switches, relays and starters shall be clearly tagged and identified. Wording shall be identical to that on the control diagram in the Contract Drawings.

2.5 GENERAL CONSTRUCTION COMPONENTS

A. Roof Curbs and Equipment Support Rails

1. General: Factory fabricated, minimum 12-inch high, galvanized steel, configured to account for roof pitch where pitch exceeds 1/4-inch/ft or where required by manufacturer of supported equipment. Coordinate with roofer and provide cant and step if needed to match roof construction.

2. Roof Curbs: 1.5-inch fiberglass insulation with nominal 2” x 2” wood nailer. Provide damper tray where a damper is indicated. Thycurb TC, Greenheck, RPS, OAE.

3. Equipment Support Rails: Nominal 2” x 4” wood nailer. Thycurb TEMS, Greenheck, RPS, OAE.

B. Painting: Finish painting of mechanical systems and equipment will be under Spec Section 09 9100, “Painting,” unless equipment is specified to be provided with factory-applied finish coats.

2.6 MISCELLANEOUS PROVISIONS

A. Flow Diagrams: Provide half-size prints of each system flow diagram, including air handling, steam, chilled water, heating water, domestic water, domestic HW, etc. Mount framed under plexiglass, and locate either on the associated AHU or on a nearby wall. Incorporate any as-built revisions.

PART 3 - EXECUTION

3.1 INSTALLATION GENERAL REQUIREMENTS

A. Cooperation with Other Trades: Refer to other parts of these Specifications covering the work of other trades which must be carried on in conjunction with the mechanical work so that the
construction operations can proceed without harm to the Owner from interference, delay, or absence of coordination. Be responsible for the size and location of all openings, foundations, etc.

B. Trenching and Backfilling: Provide all excavation, trenching and backfilling required for the installation of the work of this division.

C. Manufacturer's Instructions: Install all products in accordance with manufacturers’ recommendations and the requirements of any applicable listings. If manufacturers’ recommendations and/or requirements of applicable listings conflict with plans and specifications, report such conflicts to the Owner's Representative.

D. Field Measurements: Verify all dimensions and conditions governing the work. Examine adjoining work on which the work of this Division is dependent, and report any deficiencies.

E. Do not compromise the building structural, fire resistant construction or vapor barrier system.

F. Supports for Equipment and Systems: Foundations and structural supports for equipment will generally be provided by others. The contractor for this division shall provide supplementary supports as required to support equipment, distribution systems, and other components installed under this division. Prior to installing mechanical work, examine foundations and supports to ensure they are adequate to properly support the equipment. Provide all necessary foundations, structures, supports, inserts, sleeves, etc, for installation of mechanical and plumbing equipment, ductwork and piping, etc. Coordinate installation of such devices with all disciplines. Verify that the devices and supports are adequate as intended and do not overload the building structure.

G. Concealed or Buried Work: For work which is underground or which will be concealed by building construction, provide digital photographs to document the installation throughout the construction project, but not less than weekly. Include plans indicating where the photographs were taken. Notify the OR of when the work will be complete and provide OR a minimum five-day period to inspect the work after completion but prior to when it is backfilled or concealed by building construction.

H. Access Doors: Provide as required for access to valves, dampers, controls, or other items for which access is required for either operation or servicing. The type of access door shall be as required by the room finish schedule.

I. Alignment of Flexible Couplings: Flexible couplings between motors and driven equipment shall be aligned by a qualified service technician after the equipment is installed and ready for operation. Align equipment per manufacturer’s recommendations under operating conditions and temperature. Provide written certification that each device has been so aligned.

J. Lubrication: Provide all oil for the operation of all equipment until acceptance. Be responsible for all damage to bearings while the equipment is being operated by Contractor up to the date of acceptance of the equipment. Protect all bearings and shafts during installation and thoroughly grease shafts to prevent corrosion. Bearings for items of mechanical equipment shall be marked at each bearing location as to whether the bearing is a sealed type or relubricable type unit.
K. Tests: All tests shall be conducted in the presence of the designated and authorized Owner's Representative. Notify the Owner's one week in advance of all tests. Requirements for testing are specified under the sections covering the various systems. Provide all necessary equipment, materials, and labor to perform the required tests.

L. Protection of Material and Equipment:

1. Protect all work, materials and equipment furnished and installed under Division 23, whether incorporated in the building or not.
2. All items of mechanical equipment shall be stored in a protected weatherproof enclosure prior to installation within the building, or shall be otherwise protected from the weather in a suitable manner as approved.
3. Protect all work and be responsible for all damage done to property, equipment and materials. Coordinate material storage with the Owner's Representative.
4. Pipe and duct openings shall be closed with caps or plugs, or covered to prevent lodgment of dirt or trash during the course of installation. Plumbing fixtures shall not be used by the construction forces. At the completion of the work clean and polish fixtures, equipment and materials prior to turning them over to the Owner.

3.2 DRAWINGS

A. The drawings show the general arrangement of the piping, ductwork, equipment, etc. Follow them as closely as actual building construction and work of other trades will permit. Where discrepancies occur between Plans and Specifications, the more stringent shall govern. All Contract Documents shall be considered as part of the work. Because of the small scale of the drawings, it is not possible to indicate all offsets, fittings and accessories, which may be required, and no attempt has been made to do so. Rather, the drawings convey the general design intent. Investigate the structural and finish conditions affecting the work and arrange the work accordingly, providing fittings, valves, and accessories as required to meet such conditions. Show any such changes on the Record Drawings.

B. Should any doubt or question arise in respect to the true meaning of the drawings or specifications, submit an RFI.

C. Install equipment, piping, ductwork, and electrical systems with proper clearance for operation, service, and maintenance, including minimum clearances required by applicable codes, manufacturer's installation instructions, etc. Include proper clearance in front of and above electrical equipment as defined by the National Electric Code (NEC). Piping and ductwork systems shall not be routed through or above electrical equipment rooms, telecommunications rooms, elevator machine rooms, or electrical equipment spaces within mechanical equipment rooms.
D. Arrange all concealed mechanical systems carefully to fit within the available space without interference with adjacent structural and electrical systems. Make all necessary provisions for penetrations of piping and ductwork, including sleeves and blockouts in structural systems. The exact location of all exposed mechanical systems, including grilles, registers, and diffusers; access doors; sprinkler heads; piping and ductwork exposed within finished areas; and other equipment and devices as applicable, shall be coordinated with the Architect, who shall have final authority for the acceptance of the work as it relates to the aesthetic design for the facility.

3.3 INTERRUPTING SERVICES

A. Coordinate the installation of all work within the building in order to minimize interference with the operation of existing building mechanical, plumbing, fire protection, and utility systems during construction. Connections to existing systems requiring the interruption of service within the building shall be carefully coordinated with the Owner to minimize system downtimes. Requests for the interruption of existing services shall be submitted in writing a minimum of two weeks before the scheduled date. Absolutely no interruption of the existing services will be permitted without written review and authorization.

3.4 INSTALLATION CHECK

A. An experienced, competent, and authorized representative of the equipment listed below shall visit the site of the work and inspect, check, adjust if necessary, and approve the installation for the equipment listed below. The equipment supplier's representative shall revisit the job site as often as necessary until all trouble is corrected and the equipment installation and operation is approved and accepted.

B. Each equipment supplier's representative shall furnish a written report certifying that the equipment (1) has been properly installed and lubricated; (2) is in accurate alignment; (3) is free from any undue stress imposed by connecting piping or anchor bolts; and, (4) has been operated under full load conditions and that it has operated satisfactorily.

C. Equipment requiring installation check includes the following:

- Chillers
- Pumps 25 hp and larger
- Boilers
- Water Softener
- Domestic Hot Water Heaters
- Cooling Towers
- Water Treatment Systems (Cooling Tower and Boilers)
- Deaerator
- Pressure Reducing Stations
- Sump Pump and Sewage Ejector Systems
- Fire Pump Systems
- Domestic Water Booster Pump Systems
- Air Handling Units
3.5 OPERATION PRIOR TO ACCEPTANCE

A. Operation of equipment and systems for the benefit of the Owner prior to substantial completion will be allowed provided that a written agreement between the Owner and the Contractor has established warranty and other responsibilities to the satisfaction of both parties.

B. Operation of equipment and systems for the benefit of the Contractor, except for the purposes of testing and balancing, will not be permitted without a written agreement between the Owner and the Contractor establishing warranty and other responsibilities.

3.6 OPERATION AND MAINTENANCE (O&M) INSTRUCTIONS

A. At completion of the project provide two complete bound sets of the following documents, along with two CDs containing searchable PDFs of these documents. Organize bound information in a logical fashion with a table of contents and tabs for the different sections. Organize PDFs in a logical fashion with bookmarks to assist the operating personnel in retrieving desired data. Provide minimum two 1-hour sessions to instruct Owner's facility personnel in how to find information in the bound O&Ms and the PDFs. Take attendance and submit the attendance list to the Owner's Representative. Include the following:

1. Approved Submittals.
2. Test reports.
3. O&M manuals and instructions covering all equipment supplied under this Division, with all non-applicable information crossed out. Clearly identify all required routine maintenance. Include parts lists.
4. A master Lubrication Chart listing each piece of equipment, the recommended oil or grease, and the recommended frequency of lubrication.
5. The names and addresses of at least one service agency capable of providing required maintenance for each item of equipment supplied.
6. Complete temperature control diagrams including control descriptions, system sequence of operation, operating instructions, control system maintenance and calibration information, wiring diagrams, and all control setpoints. See Section 23 0900 for additional requirements.

B. See Division 1 for additional requirements concerning manuals, manual distribution, and maintenance materials.

C. Submit O&M manuals for review and distribution to the Owner not less than two weeks prior to the date scheduled for O&M instructions as specified.
D. Demonstrate proper system operation to the owner’s operating staff. Provide the services of the contractor and subcontractors (e.g., mechanical, T&B, temperature control, etc), as required to properly demonstrate system operation. Demonstration shall consist of two 1-hour hands-on owner training sessions.

3.7 RECORD DRAWINGS

A. See Division 1, for additional requirements associated with Project Record Drawings.

B. Maintain a full-size set of marked-up prints showing the installed location and arrangement of all work under this division, and in particular where changes were made during construction. Keep record drawings accurate and up-to-date throughout the construction period. Owner’s Agents may request to review record drawings during construction and in conjunction with review and approval of monthly pay requests. Include copies of all addenda, RFIs, bulletins, and change orders neatly taped or attached to record drawing set. At the completion of the project send the Engineer full-size plans clearly showing all changes from the original design marked up in red so as to facilitate the Engineer incorporating these changes into the Engineer’s CADD files. Forward record drawings to the Owner's Representative prior to submitting a request for substantial completion.

3.8 SITE VISITS AND OBSERVATION OF CONSTRUCTION

A. The Engineer may make periodic visits to the project site at various stages of construction in order to observe the progress and quality of various aspects of the work so as to determine if such work is proceeding in general accordance with the Contract Documents. This observation will not release the Contractor from his responsibility to supervise, direct, and control all construction work and activities. The Engineer has no authority over, or responsibility for means, methods, techniques, sequences, or procedures of construction or for safety precautions and programs, or for failure of the Contractor to comply with applicable laws, regulations, or codes.

B. Prior to substantial completion, request that the Engineer provide a final observation visit. Complete the attached "Final Observation Checklist," and include it with this request. For any items that are not applicable, mark them "N/A."

3.9 PROJECT CLOSEOUT

A. Submit written certification that all work complies with the specifications and applicable codes. Submit certifications and acceptance certificates including proof of delivery of record drawings, O&M manuals, spare parts required, and equipment warranties.

END OF SECTION 23 05 00
CONTRACTOR'S MECHANICAL & PLUMBING CHECK LIST
(ALL APPLICABLE ITEMS MUST BE COMPLETED PRIOR TO FINAL OBSERVATION)

In advance of requesting a final mechanical observation for installed mechanical systems, please check all items that have been completed. For all items not applicable to this project mark N/A.

PLUMBING/PIPING

1. All plumbing fixtures are set, sealed and cleaned.
2. All domestic and HVAC pipe systems are insulated.
3. All pipe systems are identified with specified labels and directional arrows.
4. Floor sinks and drain grates are cleaned and debris removed.
5. Valve tags are installed.
6. Special equipment (water softeners, water heaters, piping systems, etc.,) have been checked and put into service.
7. Medical gas systems have been checked and certified.
8. Special piping systems have been cleaned and pressure tested.
   - Fuel Handling
   - Process Piping
   - Compressed Air
   - Nitrogen
   - Natural Gas
   - Vacuum
   - Argon
   - Medical Gas
   - Other
9. Limestone chips have been installed in acid dilution sumps.
10. Plumbing/piping connections have been completed to Owner-furnished equipment and equipment furnished by other Contractors/Subcontractors.
11. Exterior wall hydrants have been cleaned.
12. Concrete collars have been installed at clean-out to grade, valve box, or other specified plumbing items.
13. Drains and relief lines from plumbing and HVAC equipment have been installed and secured in a proper manner.
14. All plumbing equipment and areas of equipment have been cleaned and debris removed.

15. All plumbing equipment required by the Specifications has been identified and/or numbered.

16. Domestic water systems sterilization has been completed.

17. Refrigerant piping/system has been charged and tested.

18. Strainers/suction diffusers have been cleaned.

19. Backflow preventers have been tested.

20. Air has been vented from all coils and systems.

21. Water treatment systems have been charged and tested.

<table>
<thead>
<tr>
<th>Chilled Water</th>
<th>Condenser Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hot Water</td>
<td>Steam/Condensate</td>
</tr>
</tbody>
</table>

22. Ethylene glycol system has been charged with correct mixture and tested.

23. Water systems have been cleaned (X) and pressure tested (P)

<table>
<thead>
<tr>
<th>Chilled Water</th>
<th>Condenser Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hot Water</td>
<td>Non-potable Water</td>
</tr>
<tr>
<td>Steam</td>
<td>Domestic Hot Water</td>
</tr>
<tr>
<td>Condensate</td>
<td>Domestic Cold Water</td>
</tr>
<tr>
<td>Fire Protection</td>
<td>Acid Waste and Vent</td>
</tr>
<tr>
<td>Sanitary Sewer and Vent</td>
<td>Heat Recovery Piping</td>
</tr>
<tr>
<td>Roof and Overflow Drains</td>
<td>Other (list)</td>
</tr>
</tbody>
</table>

24. PRVs have been adjusted (water, steam, gases).

**FIRE PROTECTION**

1. Fire protection piping is completed.

2. Fire protection system has been certified by the Fire Marshal's office.

3. All electrical interlocks between the fire sprinkler components and the fire panel have been checked for operation.

4. Spare sprinkler head, wrench and cabinet are installed.

**HVAC - EQUIPMENT AND DUCTWORK**

1. All ductwork has been sealed and insulated.

2. Return air paths and transfer openings have been verified.
3. Air handlers have been cleaned inside and out and construction filters removed and replaced with final filters.

4. All air handling equipment has been started and operated for the specified time.

5. All equipment isolators have been adjusted for specified deflection.

6. All VAV boxes, fan coils, or fan powered boxes are completed and operational.

7. All pump shafts and couplings have been aligned.

8. Ductwork, coils, housing, diffusers, registers and grilles have been cleaned.

9. Boilers have been fired and certified by the supplier.

10. Cooling towers have been started and inspected by the supplier.

11. Chillers have been charged, started and certified for operation by the supplier.

12. Fire dampers are accessible and fully operational.

13. All HVAC equipment has been lubricated.

14. HVAC equipment has been labeled in accordance with the Specifications.

15. Duct pressure testing is complete and accepted.

16. "HAZARDOUS AREA" signs installed where applicable.

17. Belt guards installed where applicable.

18. Variable frequency drives have been tested by the manufacturer's representative and certified to be in compliance with all of the specified requirements.

19. Testing and balancing has been completed, and deficiencies noted have been corrected.

20. Special systems have been started and tested, such as: Humidification, laboratory hoods, kitchen hoods, and Owner-furnished items.

TEMPERATURE CONTROLS

1. Temperature control panels and devices have been labeled in accordance with the Specifications.

2. All control dampers close completely and edge and blade seals form tight seal.

3. All control valves have been piped as required by the Drawings.

4. Controls systems are completed and all control points are operating and recording properly.
5. All temperature control tubing and wiring is installed and secured in accordance with the Specifications and the electrical code.

6. Smoke removal fans and/or smoke detectors have been tested for operation and shutdown.

7. Freezestats have been tested ensuring fan shutdown and full damper closure.

8. Operator training for temperature controls has taken place.

9. Refrigerant sensors and equipment room shutdown have been tested.

GENERAL ITEMS

The following specified items have been submitted:

1. Record Drawings (to be submitted prior to final payment to the Contractor).

2. Operation and maintenance manuals.

3. Manufacturer's representative installation check and certification submitted (see list of equipment, Section 23 0500).

4. Testing and balancing reports.

5. Test kits furnished to Owner.

6. Temperature control schematics and sequence of operation.

7. Wall-mounted lubrication, valve, and temperature control charts have been installed.
LICENSE AGREEMENT FOR CADD DATABASE OR BIM MODEL

PROJECT: __________________________________________

LICENSE GRANT: Contractor is granted use of the CADD Database or BIM Model (Database/Model) for the indicated project for the specific purpose of preparing submittal documents for this Project. No other use of the Database/Model is granted. Title to the Database/Model is not transferred to the Contractor. The Database/Model may be of value to the Contractor in preparing submittals, but use of the model does not relieve the contractor of the requirement to verify measurements in the field.

COPYING RESTRICTIONS: Contractor may copy the Database/Model in whole or in part, but only for backup and archival purposes or for use by the Contractor's Subcontractors. Contractor agrees to ensure that any entities that receive the Database/Model from Contractor, either in whole or in part, comply with the terms and conditions of this agreement. Contractor shall safeguard the Database/Model from falling into the hands of parties other than Subcontractors with a legitimate need for it.

WARRANTY: Bridgers & Paxton (B&P) offers this Database/Model without warranty and specifically without express or implied warranty of fitness. If Contractor chooses to use the Database/Model, then he does so at his own risk and without any liability or risk to B&P.

INDEMNITY: Contractor shall to the fullest extent permitted by law, defend, indemnify and hold harmless the Owner, Architect, B&P, their employees and agents from all claims, damages, losses, and attorney fees arising out of or resulting from the use of the Database/Model.

ACKNOWLEDGMENT: Contractor acknowledges that (s)he has read this Agreement, understands it, and agrees to be bound by its terms and conditions.

CONTRACTOR'S REPRESENTATIVE

Signature: ____________________________  Company Name: ________________________________

Name: ______________________________  Address 1: ______________________________

Title: ______________________________  Address 2: ______________________________

Date: ______________________________
SECTION 23 05 01

DEMOLITION

PART 1 - GENERAL

1.1 REQUIREMENTS

A. Conform with applicable provisions of the General Conditions, Supplemental General Conditions and the General Requirements.

1.2 RELATED SECTIONS

A. See Section 23 05 00, for Common Work Requirements for HVAC.

B. See Division 1, for Cutting and Patching.

1.3 SCOPE OF WORK

A. The terms "demolish" and "remove" shall mean disconnect, cart away, and dispose of off site. Components to be demolished or removed include all materials, equipment, building construction, and other components as indicated. Components to be demolished shall become the property of the contractor, and contractor may dispose of them by either landfilling or by selling salvageable parts and recyclable materials to legitimate third parties.

B. Except as specifically noted, asbestos abatement will be by others, and is not included in this contract. Advise Owner sufficiently in advance of demolition work so that Owner may arrange to have asbestos removed without delaying demolition or construction work.

C. The Owner retains the first right of refusal on all components to be removed. When requested, remove components carefully and deposit components in locations as directed by the Owner.

PART 2 - PRODUCTS

Not Applicable.
PART 3 - EXECUTION

3.1 GENERAL

A. Within four weeks after notice to proceed, and a minimum of two weeks prior to any demolition activities, submit a project schedule indicating all demolition work. Schedule all work to minimize interruptions in utility services to the facility. Interruptions generally will be allowed only outside normal operating hours. Sequence all work in accordance with the drawings and the Project Manual.

B. Take care not to damage equipment, materials, components, and building construction which is to remain in service. Provide blind flanges, caps, etc, so as to prevent accidental discharge of water, etc.

C. Do not interfere with the Owner’s access to buildings and equipment. If any activities cause interference which is objectionable to the Owner, contractor shall modify his means and methods, or reschedule those activities outside occupied hours at no additional cost to the Owner.

D. Where existing systems must remain in service during the construction project, make whatever provisions are necessary to accomplish this. This includes providing blind flanges and caps, temporary insulation, duct caps, etc, to allow for proper system operation.

3.2 EQUIPMENT

A. General: Disconnect and remove piping, ductwork, controls, power, and equipment supports. Wherever possible, remove equipment as a whole. Do not cut up equipment in place unless approved in advance by the Owner.

3.3 PIPING

A. Disconnect piping as indicated, and remove all piping not required in the final, upgraded condition of the systems. This includes removal back to the headers and mains which must remain in service. The existing valving may not hold tight. Arrange in advance for shutdowns as required. Provide caps, blind flanges, etc, as indicated on drawings, as required to facilitate construction activities, and as required to facilitate owner’s use of the system.

B. Remove all components in piping system, including valves, fittings, flanges, strainers, anchors, guides, hangers, supports, supplementary steel, attachments to structure, instrumentation, insulation, etc.

C. Patch all openings in walls, floors, roofs, partitions, gratings, etc, which remain after piping is removed.
D. Provide vents and drains in the piping which will remain in service, where necessary to facilitate refilling, venting, and future system operation.

3.4 DUCTWORK

A. Disconnect ductwork as indicated, and remove all ductwork not required in the final, upgraded condition of the systems. This includes removal back to the mains which will remain in service. Arrange in advance for shutdowns as required. Provide caps as indicated on drawings, as required to facilitate construction activities, and as required to facilitate the Owner’s temporary and final use of the systems.

B. Remove all components in ductwork system including fittings, dampers, grilles, registers, diffusers, louvers, hangers, supports, supplementary steel, attachments to structure, instrumentation, insulation, acoustic lining, etc.

C. Patch all openings in walls, floors, roofs, partitions, gratings, etc, which remain after ductwork is removed.
3.5 CONTROLS

A. Remove all controls associated with equipment, piping and ductwork which are to be removed. Controls shall include instrumentation, control panels, wiring, conduits, tubing, supports, and attachments to structure. Where wiring is run in conduit in concealed locations, remove the wiring, cap both ends of conduit, and label conduit as "ABANDONED" at both ends.

3.6 ELECTRIC POWER

A. Remove all electric power associated with equipment, controls and accessories which are to be removed. Electric power shall include starters, disconnects, wiring and conduit from MCC’s and distribution panels to local starters and disconnects, wiring and conduit from local starters and disconnects to equipment, supports, attachments to structure, and concrete housekeeping pads. Label all associated breakers as "SPARE." Where MCC’s serve equipment to be removed and no new equipment is to be served from the same starter, leave the starter in place and label it as "Spare Size X Starter."

B. Where wiring runs in conduit within concealed locations, remove the conductors, cap both ends of conduit, and label conduit as "ABANDONED" at both ends. Where wiring runs below grade, remove conductors, cap conduit at both ends, and abandon in place. Where wiring runs below concrete floor slabs, chip out concrete around conduit, remove conduit to bottom of slab level, and patch floor to match adjacent surfaces.

3.7 EQUIPMENT SUPPORTS

A. Housekeeping Pads: Remove housekeeping pads for equipment to be removed. Remove all tripping hazards and resurface floor to match surrounding floor.

B. Equipment Foundations: Remove foundations, remove all tripping hazards, backfill as required, compact to 95% Standard Proctor Density, and pour floor slab to match existing.

C. Support Steel: Remove all support steel including attachments to building or to grade.

3.8 MEANS OF ACCESS

A. Remove all service platforms, catwalks, ladders, etc. which are required solely for the equipment, valves, and instrumentation which are being removed as part of this work.

END OF SECTION 23 05 01
SECTION 23 30 00
AIR TEMPERING SYSTEM AND EQUIPMENT

PART 1 - GENERAL

1.1 REQUIREMENTS
   A. Provide all products, labor and services necessary to construct and demonstrate proper functionality of the HVAC and exhaust systems indicated on the drawings and specified herein.
   B. Conform with applicable provisions of the General Conditions, the Supplemental General Conditions and General Requirements.
   C. See Sections 23 0500 and 23 0501 for additional requirements.
   D. Comply with the Equipment General Requirements in Spec Section 23 0500.

1.2 SCOPE
   A. Install control dampers supplied under Section 23 0900. Adjust dampers for smooth operation.

1.3 SUBMITTALS
   A. Submit the following for review and approval:
      1. All equipment shown on the equipment schedule and elsewhere on the drawings. Submit evidence or certification that equipment complies with ASHRAE Std. 90.1.
      2. Ductwork construction standards, sheet metal, plenums, ductwork accessories, etc.
      3. Flues and vents: Materials of construction and accessories. For vents with horizontal offsets or expansion joints, submit layout for review.
      4. Dampers for fire and smoke control: For each type of damper proposed, submit manufacturer's literature demonstrating compliance with all aspects of the specifications and drawings. Submit manufacturer's installation instructions.
      5. Air Filters and Filter Gauges
      6. Grilles, Registers & Diffusers: Configuration, materials of construction, finish, mounting details, and performance data including throw, static-pressure drop, and noise ratings. Submit for type only, but supplier shall check and verify that the indicated diffuser type and sizing are appropriate for each area. Advise of any concerns in any areas.
7. Layouts of systems covered by this section of the specifications. Layouts shall be at a scale appropriate for the areas shown. Include large scale sections as appropriate.

1.4 QUALITY ASSURANCE

A. Comply with the following codes & standards:

1. UMC 2006 Chapter 6 – Duct Systems
2. UMC 2006 Standard 6-2, Standard for Metal Ducts
3. SMACNA 1995 HVAC Duct Construction Standards – Metal and Flexible, including Addendum 1 dated 11/1997
4. SMACNA Round Industrial Duct Construction Standards – 1999
5. SMACNA Rectangular Industrial Duct Construction Standards – 2004

B. Component Characteristics

1. All components within ducts and plenums shall be non-combustible or shall have a flame spread less than 25 and smoke developed less than 50 when tested as a composite product per NFPA 255, ASTM E84, or UL 723, except where specifically permitted by the UMC and noted in the drawings or specs.

1.5 SOUND LEVELS

A. Sound levels attributable to mechanical equipment are designed to result in sound levels of NC 40 for offices, conference rooms, and NC 35 for library, classrooms, etc., measured within the rooms. Mechanical equipment that has been substituted for the specified equipment shall perform within the specified equipment sound limitations, or will be replaced or adjusted as required. Sound levels attributable to duct vibration that result in noticeable noise or vibration to duct hangers, lighting fixtures, ceiling tees or diffusers shall be re-supported or adjusted until the disturbing noise is brought within acceptable limits.
1.6 DIMENSIONS

A. Compare all drawings and verify all dimensions both on the drawings and in the field before laying-out, cutting, and fabricating the work.

B. Refer to Section 23 0500, Common Work Requirements for HVAC, for coordination drawing requirements.

PART 2 - PRODUCTS

2.1 DUCTWORK AND PLENUMS

A. Materials: Construct all ducts, casings, plenums etc. from galvanized steel sheets except as indicated. Sheets shall be free of blisters, slivers, pits, and imperfectly galvanized spots. Reinforcing angles and bars, and duct support materials shall be same material as ductwork if exposed to the air stream, or galvanized steel if not exposed to the air stream.


2. Aluminum: Alloy 3003-H14

3. Stainless Steel: 340SS, provide No. 2B finish in exposed areas

4. Fiberglass Ductwork (Ductboard): Use only where specifically noted. Minimum 1-inch thick, 3 lb. density rigid fiberglass ductboard with glass fiber reinforced vapor barrier, UL Class 1, labeled on each board per UMC-06 Standard 6-5.

a. Properties:
   1) Thermal conductivity for 1-inch thickness shall not exceed 0.22 Btuh/SF-F at 75 deg F
   2) Noise reduction coefficient of 0.80 on Mounting No. 6.

b. Tape: 3-inch "Hardcast" mineral impregnated woven fiber tape with an actuator/adhesive applied in accordance with the manufacturer's directions, or thermlok heat sensitive tapes. Pressure sensitive tapes will not be accepted.

c. Owens-Corning Fiberglass, Johns Manville, Certain-Teed or equivalent. Flexural rigidity (E.I.) average shall not be less than 475.

5. Polyvinyl Coated Galvanized Steel: Minimum 4 mil polyvinyl coating. Foremost Manufacturing Company, Southfield, Michigan. Model PCD 4 by 1 for exterior coating only, or Model PCD 4 by 4 for both interior and exterior coating.

B. Flexible Ducts: Factory fabricated, listed as a Class 1 Air Duct per UL 181 with aluminum foil interior liner, corrosion resistant helix mechanically locked to fabric to ensure dimensional stability, helix separated from air stream, 1.5-inch fiberglass insulation with conductance not to exceed 0.23 Btu-h/ft-Hr-SF-F, and fire retardant outer vapor barrier. Ducts shall be rated at 12-inch positive pressure, 5-inch negative pressure, 0.1 perm per ASTM E96, and -20 to +250°F. Flexmaster Type 5, Technaflex 57K, OAE.
C. Ductwork Accessories

1. Sealers: Water based, for use on galvanized steel and with the other materials specified herein, suitable for use at -20 to +200°F and duct pressures to 10 inches wg, dry to the touch within 12 hours, sufficiently flexible to pass a 0.25-inch mandrel test, listed per UL-181A & 181B, and suitable for storage and application at 40–110°F. Approved Manufacturers: Carlisle Coatings & Waterproofing “Hardcast,” Foster, RCD, AM Conservation Group, OAE.

2. Tapes: 4” woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal. Water, mold, and mildew resistant for indoor and outdoor service. Sealant shall be modified styrene acrylic.

2.2 SHEET METAL ACCESSORIES

A. Dampers: Factory fabricated, suitable for use with air at -20 to +240°F, galvanized steel housing and blades except as noted, rated for indicated pressures in either direction and performance rated per AMCA-500.

1. Shafts: Square or hexagonal steel, 3/8-inch or 1/2-inch, continuous through damper, mechanically fastened to damper blade, and extending through frame as required for actuator or standoff bracket and locking quadrant as required by table below.

2. Bearings: Provide for each side of each shaft, molded synthetic or stainless steel sleeve type.

3. Multi-blade dampers: Except as indicated, provide parallel-blade for 2-position applications and opposed blade for modulating applications. Provide jackshafts as required to drive large dampers.

4. Air pressure drop shall not exceed:

   a. Dampers rated at 1500 FPM: ____ in wg at 1500 FPM
   b. Dampers rated at 4000 FPM: ___ in. wg at 4000 FPM

5. The dampers described in this section are assigned Type Numbers D1 through D23. The following table summarizes key characteristics of each type of damper. Drawings and Part 3 – Execution, indicate which type of damper to use in each application.

<table>
<thead>
<tr>
<th>Type</th>
<th>Shape</th>
<th>Blade</th>
<th>Max Size (inches)</th>
<th>Multiple Sections</th>
<th>Rated Velocity (FPM)</th>
<th>Rated Shutoff Press. (in. wg)</th>
<th>Seals</th>
<th>Leakage (CFM/SF @ 1 in. DP)</th>
<th>Notes</th>
<th>Ruskin Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>D1</td>
<td>Rect</td>
<td>Flat</td>
<td>36 x 12</td>
<td>No</td>
<td>1500</td>
<td>2.5</td>
<td>No</td>
<td>--</td>
<td>1</td>
<td>MD15</td>
</tr>
<tr>
<td>D1</td>
<td>Rect</td>
<td>3V</td>
<td>48 x 48</td>
<td>No</td>
<td>1500</td>
<td>2.5</td>
<td>No</td>
<td>--</td>
<td>1</td>
<td>MD15</td>
</tr>
<tr>
<td>D2</td>
<td>Rect</td>
<td>Flat</td>
<td>36 x 12</td>
<td>No</td>
<td>1500</td>
<td>2</td>
<td>No</td>
<td>--</td>
<td>1</td>
<td>MD25</td>
</tr>
<tr>
<td>D3</td>
<td>Rect</td>
<td>3V</td>
<td>48 x 48</td>
<td>Yes</td>
<td>1500</td>
<td>2</td>
<td>No</td>
<td>80</td>
<td>1</td>
<td>MD35</td>
</tr>
<tr>
<td>D4</td>
<td>Rect</td>
<td>3V</td>
<td>48 x 72</td>
<td>Yes</td>
<td>1500</td>
<td>2.5</td>
<td>No</td>
<td>40</td>
<td>2</td>
<td>CD35</td>
</tr>
<tr>
<td>D5</td>
<td>Rect</td>
<td>3V</td>
<td>48 x 72</td>
<td>Yes</td>
<td>1500</td>
<td>2.5</td>
<td>Yes</td>
<td>4</td>
<td>2</td>
<td>CD36</td>
</tr>
<tr>
<td>D6</td>
<td>Rect</td>
<td>Airfoil</td>
<td>60 x 72</td>
<td>Yes</td>
<td>4000</td>
<td>6</td>
<td>Yes</td>
<td>2</td>
<td>2</td>
<td>CD50</td>
</tr>
<tr>
<td>D7</td>
<td>Rect</td>
<td>Airfoil</td>
<td>60 x 72</td>
<td>Yes</td>
<td>4000</td>
<td>6</td>
<td>Yes</td>
<td>2</td>
<td>CD60</td>
<td></td>
</tr>
<tr>
<td>----</td>
<td>------</td>
<td>---------</td>
<td>---------</td>
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<td>---</td>
<td>------</td>
<td></td>
</tr>
<tr>
<td>D20</td>
<td>Round</td>
<td>Flat</td>
<td>20</td>
<td>No</td>
<td>1500</td>
<td>2</td>
<td>No</td>
<td>40</td>
<td>1</td>
<td>MDSR25</td>
</tr>
<tr>
<td>D21</td>
<td>Round</td>
<td>Double</td>
<td>40</td>
<td>No</td>
<td>4000</td>
<td>10</td>
<td>Yes</td>
<td>4</td>
<td>CDR25</td>
<td></td>
</tr>
<tr>
<td>D22</td>
<td>Round</td>
<td>Double</td>
<td>24</td>
<td>No</td>
<td>4000</td>
<td>6</td>
<td>Yes</td>
<td>6</td>
<td>CDSR25</td>
<td></td>
</tr>
<tr>
<td>D23</td>
<td>Oval</td>
<td>Double</td>
<td>72 x 24</td>
<td>No</td>
<td>4000</td>
<td>10</td>
<td>Yes</td>
<td>4</td>
<td>CDO25</td>
<td></td>
</tr>
</tbody>
</table>

Note 1: Provide locking hand quadrant and 2-inch standoff bracket
Note 2: Aluminum Construction

B. Flexible Connectors: Except as noted flexible connectors shall be heavy fiberglass cloth; coated to be air tight, water tight, fire retardant; suitable for temperatures of -20 to +200°F; rated for 10 in. wg positive or negative; with tensile strength minimum 450 lb/inch in the warp and 340 lb/inch in the filling. Provide flexible connectors in 3-3-3 configuration, with 3-inch galvanized steel strip along each edge and 3-inches of flexible fabric in the center.

1. Standard Applications: Flame spread 20, smoke developed 40, Ventfabrics Ventglas OAE
2. Applications Exposed to Sun and Weather: Double coated with du Pont Hyphalon, Ventfabrics Ventlon OAE.
3. Applications from 200 – 500°F: Tensile Strength 285 lb/inch in the wrap and 185 lb/inch in the filling. Ventfabrics Ventsil OAE
4. Corrosive Applications: Teflon coated, Ventfabrics Ventel OAE.

C. Duct and Plenum Access Doors: Galvanized steel, gasketed. Size as required to properly inspect and service components located within the ductwork. Ruskin, Acudoor, Ductmate, OAE.

1. Rectangular ducts up to 2-inch positive or negative SP: Minimum 22 gauge frame and door thru 12-inch size, 20 gauge door for larger sizes, double gasketed (between door and frame, and between frame and duct) with cam locks, either hinged or removable. Ruskin ADH2, ADC22, ADHW22, or ADCW22, Ventfabrics, OAE
2. Round or Rectangular Ducts to 12-inch Positive Pressure: Removable oval sandwich style with gasketed inner door, insulated outer door, and large hand knobs. Ruskin ADR and ADF.
3. Ducts to 12-inch Negative Pressure: Ruskin ADHP-3.
4. Plenum Access Doors: Factory fabricated frame and door rated to 4-inch positive or 8-inch negative pressure. Provide mill finish and neoprene seals to limit leakage to less than 0.1 CFM/inch perimeter with door closed. Doors shall open against air pressure.
   a. Frame: Extruded aluminum with 1.5-inch flange and mitered corners
   b. Door: Extruded aluminum mitered frame, double wall 24-gauge galvanized steel panel with minimum R-5 insulation isolated from the air stream, full-length piano hinge and two heavy-duty latches similar to Ventlok 310.
   c. Approved Manufacturers: Ruskin GPAD or approved equal.

D. Turning Vanes:
1. Single wall: Per SMACNA HVAC Duct Construction Standards Figure 2-3 & 2-4.
2. Double wall: Airfoil shape with smoothly rounded entry nose and extended trailing edge, minimum 2” x 3” vane cross section, hot dipped galvanized steel, 26-gauge vanes, 24-gauge runner, each vane double pinned to each runner, field adjustable to required elbow aspect ratio. Performance shall not exceed the following for a 24 x 24 elbow at 2000 FPM average: Air pressure drop 0.105 in. wg; around generated 54 dB re 10^-12 watts. Aero/Dyne Co. Model HEP, Airsan, Elgen, or equivalent.

E. Roof Curbs and Equipment Support Rails: Factory fabricated, minimum 12-inch high, galvanized steel, configured to account for roof pitch where pitch exceeds 1/4-inch/ft or where required by manufacturer of supported equipment. Coordinate with roofer and provide cant and step if needed to match roof construction.

1. Roof Curbs: 1.5-inch fiberglass insulation with nominal 2” x 2” wood nailer. Provide damper tray where a damper is indicated. Thycurb TC, Greenheck, OAE.

2. Equipment Support Rails: Nominal 2” x 4” wood nailer. Thycurb TEMS, Greenheck OAE.

F. Thermometers: As specified in Section 23 0505.

G. Barometric Pressure Balance Dampers: Air Balance, Inc. units with adjustable counter weight, aluminum air foil design blades, nylon bearings. Match frame assembly to wall or duct.

2.3 DAMPERS FOR FIRE AND SMOKE CONTROL

A. General: Factory assembled and UL listed as an assembly, suitable for horizontal or vertical air flow and for ducted or un-ducted applications. Fire dampers (FDs) shall be listed per UL 555, smoke dampers (SMDs) shall be listed per UL 555S, and fire/smoke dampers (FSDs) shall be listed per UL 555 and UL 555S. Units shall be galvanized steel except as noted. Approved manufacturers: Greenheck, Ruskin, Potorff, or approved equal.

B. Combination Fire/Smoke Dampers: Factory assembled complete with damper, actuator, thermal link, and all specified accessories, all mounted on a sleeve.

1. Construction: Round blades, rectangular parallel blades and rectangular opposed blades are acceptable, except dampers shall be rectangular opposed blade type when installed in any of the following conditions: within 10 diameters of a fan or supply register, within 3 diameters of an elbow. Internal frames in rectangular FSDs shall be low profile type for ducts 17”H and less.

2. All components factory installed and wired, including actuator, thermal link, position switches, temperature over-ride (if specified), test switch (if specified), etc. Mount all such components on outside of FSD sleeve to the side of duct (not top or bottom) except where indicated or approved. FSDs must be suitable for rotating the unit 180-degrees so these components can be on either side of the duct.

3. Air pressure drops shall be certified per AMCA 500D. Pressure loss coefficient C_o shall not exceed the following when tested per AMCA Figure 5.3:
ENTRY SECURITY MODIFICATIONS

RIO RANCHO, NEW MEXICO

<table>
<thead>
<tr>
<th>Size (in)</th>
<th>3-V Blade</th>
<th>Airfoil Blade</th>
<th>Round</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 x 12</td>
<td>2.41</td>
<td>2.01</td>
<td>NA</td>
</tr>
<tr>
<td>24 x 24</td>
<td>0.65</td>
<td>0.60</td>
<td>NA</td>
</tr>
<tr>
<td>36 x 36</td>
<td>0.44</td>
<td>0.27</td>
<td>NA</td>
</tr>
<tr>
<td>12 x 48</td>
<td>0.76</td>
<td>0.91</td>
<td>NA</td>
</tr>
<tr>
<td>12 Round</td>
<td>NA</td>
<td>NA</td>
<td>0.33</td>
</tr>
<tr>
<td>24 Round</td>
<td>NA</td>
<td>NA</td>
<td>0.23</td>
</tr>
</tbody>
</table>

4. Listed for installation within wall, floor or ceiling assemblies as indicated on drawings.
   a. Ratings, except as noted: 1.5-hr Fire Rated, Leakage Class 1, 350°F, 4-inch Static Pressure, Dynamic.
      1) Up to 1600 FPM: Greenheck FSD-211 (3-V blade type), OFSD-211, or FSDR-511 (round).
      2) Up to 3000 FPM: Greenheck FSD-311 or 311V (airfoil blade) or OFSD-311.
   b. 3-Hr Rated Walls: Greenheck FSD-231.
   c. Stainless Steel: Greenheck SSFSD-211 or SSFSDR-511 (round).

5. Actuators: Electric 2-position, 115/1/60 (provide factory wired transformer if required), normally closed, spring return, NEMA-1 except as noted. Actuator shall fully re-open damper when power is restored after any power interruption.

6. Accessories
   a. Transitions: Provide round-to-rectangular, oval-to-rectangular, or rectangular-to-rectangular transitions as appropriate for the application.
   b. Thermal Link: Provide re-settable bi-metallic thermal link to initiate closure when the air temperature within the duct rises to 165°F. Where indicated provide thermal links for operation at 212°F, 250°F, or 350°F. Thermal link shall be easily resettable from outside the duct.
   c. Position Switches: Provide dry contacts for remote monitoring of damper open and closed positions.
   d. Retaining plates and angles: Provide as required. Galvanized steel specifically designed for the particular FSD and included as part of the UL Listed assembly.
   e. Installation decals: Provide installation decals on the sleeve which give the installer clear installation instructions.
   f. Temperature Override Control: Provide controls so that the thermal link can be over-ridden and the FSD opened for smoke control, even if the air temperature exceeds the setting of the thermal link, provided the temperature does not exceed 350°F.

C. Smoke dampers: Similar to fire/smoke dampers noted above, except as follows:
   1. Smoke dampers shall comply with UL 555S, but need not comply with UL 555.
   2. Smoke dampers need not have a fire rating.
   3. The thermal link and temperature override are not applicable.
   4. Suitable for installation within a wall, floor or ceiling assemblies as indicated.
a. Ratings, except as noted: Leakage Class 1, 350°F, 4-inch Static Pressure, Dynamic.
   1) Up to 1600 FPM: Greenheck SMD-201 (3-V blade type) or SMDR-501 (round).
   2) Up to 3000 FPM: Greenheck SMD-301, 301V (airfoil blade) or SMDR-401.
b. 6-inch pressure rated: Similar to Greenheck SMD-401

D. Fire Dampers: Dynamic rated, suitable for closing against 8-inch differential pressure. Curtain type with sleeve and 165°F replaceable fusible link, resettable. Provide round-to-rectangular, oval-to-rectangular, or rectangular-to-rectangular transitions as appropriate.
   1. 1.5-hr rated: Greenheck DFD-155
   2. 3-hr Rated: Greenheck DFD-355.
   3. Provide 212°F fusible links for high temperature applications.

E. Ceiling Radiation Dampers: UL Classified for use with fire rated floor/ceiling assemblies, with 165°F fusible link replaceable through the damper assembly, 1.5-hr rated except as noted. Greenheck CRD-1, CRD-2 (round), CRD-60, or CRD-60X. Provide 212°F fusible link and 3-hr rated dampers where indicated.

2.4 FILTERS AND FILTER GAUGES

A. Rated per ASHRAE Std. 52.1; Class 1 or 2 per UL Std. 900; glass fiber media; suitable for operation from -20°F to +170°F; corrosion resistant; suitable for installation with pleats either horizontal or vertical, and for air flow horizontal, vertical upflow, or vertical downflow; suitable for face velocity up to 625 FPM. Unless specified elsewhere, pre-filters shall be MERV-7, and final filters (where specified) shall be MERV-14. AAF, Camfil Farr, or approved equal.

<table>
<thead>
<tr>
<th>MERV RATING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>7</td>
</tr>
<tr>
<td>11</td>
</tr>
<tr>
<td>11</td>
</tr>
<tr>
<td>11</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration</td>
</tr>
<tr>
<td>Initial Resistance</td>
</tr>
<tr>
<td>Rated Velocity</td>
</tr>
<tr>
<td>Max Velocity</td>
</tr>
<tr>
<td>Recommended Final Resistance</td>
</tr>
<tr>
<td>High Capacity</td>
</tr>
</tbody>
</table>
Filter Gauges: Provide a filter gauge for each bank of filters. Gauges shall be manehelic type with static pressure tips and inter-connected piping. Ranges shall be 0-1 inch w.g. for all filters except bag filters which shall have a range of 0-2 inches w.g.

2.5 GRILLES, REGISTERS AND DIFFUSERS

A. General: Performance rated per ASHRAE Std 70, Method of Testing for Rating the Performance of Air Outlets and Inlets, steel with baked white enamel finish except as noted, for installation on a fixed surface or a lay-in T-bar ceiling as indicated on architectural drawings, rigidly constructed, vibration free, with inlet collar of sufficient length to connect inlet ductwork, sized as shown on drawings. Where frames are provided for installation in fixed surfaces, frames shall be approximately 1-1/8” wide. Sound performance rated per ADC and based on room absorption of 10dBre10⁻¹² Watts and one diffuser.

1. Approved Manufacturers: Price, Krueger, Titus, Anemostat, OAE

B. Types as follows. See also the Grille and Diffuser Schedule on drawings.

1. Square Ceiling Diffusers: Louvered type, 4-way pattern, 1-piece smooth aerodynamic surfaces with no corner joints, three louvers for 12-inch sizes, four louvers for 24-inch sizes, removable louver assembly, round neck, to provide stable, horizontal air flow without dumping down to 75 FPM inlet velocity for ceiling applications, and down to 20% of maximum air flow for non-ceiling applications. Price SCD.

2. Round Ceiling Diffusers: Louvered type, 360-degree distribution, four separate 1-piece smooth aerodynamic louvers, adjustable air flow pattern (horizontal vs. vertical), round neck. Price RCD.

3. Ceiling Return, Exhaust and Transfer Grilles: 1/2” x 1/2” x 1/2” egg crate type, steel frame for surface mounting or T-bar ceiling per application, aluminum grid. Price Series 80.

4. Ceiling Rectangular Directional Diffusers: Louvered type, directional pattern as indicated on drawings, with removable louver assembly. Price SMD.


at 30-45 degrees, surface mounting frame. Price 530.

7. Ceiling or Sidewall Linear Supply Diffusers: Extruded aluminum with baked white enamel finish, frame suitable for lay-in or surface mounting as per the architectural drawings, all aluminum construction, flat black interior surfaces, air flow deflection vanes to provide each slot with individually and fully adjustable 180° air pattern from horizontal to vertical or in between, self-aligning devices to ensure proper alignment where multiple sections are required, and corner pieces as necessary for a continuous appearance. Provide galvanized steel side inlet plenum matched to diffuser, with plenum extension if necessary to match adjacent construction. Performance data is based on 3/4-inch slots unless otherwise indicated. See plans for required air flow, diffuser length, and number of slots. Price SDS with SDA or SDB plenum, Krueger 1910, or equivalent.

8. Ceiling or Sidewall Linear Return Registers: As specified for sidewall linear supply diffuser except without air flow deflection vanes. Price SDS.

9. Stainless Steel Sidewall Return/Exhaust Registers: Fixed horizontal blades at 1/2” spacing and 45° deflection, flange for surface mounting, and SS 90° quick-release fasteners to mount grille to frame. Provide mill finish for blades and No. 4 finish for flanges. Price Model 735H.

10. Stainless Steel Slot Diffuser: Consist of a 0.037”, 304 stainless steel plenum with continuous welded joints and chamfered corners to facilitate cleaning. The diffuser face shall be stainless steel construction with slots and fixed pattern deflectors. Plenums shall have stainless steel inlet collars complete with removable dampers from plenum face. The removable dampers shall be opposed blade type, constructed of stainless steel. Damper shall be adjusted without removing face of diffuser. The diffuser face shall be attached by stainless steel 90° quick-release fasteners and safety cable to open easily. The diffuser face, mounting frame, face and interior surface of plenum shall have a #4 finish. Krueger Model HORDSS or equivalent.
11. **Laminar Flow Diffuser**: Extruded aluminum construction and plated steel to inhibit corrosion. The perforated face plate, damper deflector, interior baffles and diffuser back pan plenum assembly shall be of 0.040 aluminum. The perforated face plate shall open easily with 90° quick-release fasteners and safety cable for easy cleaning and damper adjustment. B11 Sterile White-Thermal Setting finish. Krueger Model LFD or equivalent.

**PART 3 - EXECUTION**

3.1 **DUCTWORK AND PLENUMS**

A. Ductwork


2. Pressure Classes: Construct ductwork to the following pressure classes:

<table>
<thead>
<tr>
<th>Duct Element Description</th>
<th>Relative Pressure</th>
<th>Pressure Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>From Outside Air Louver to Filter:</td>
<td>N</td>
<td>1”</td>
</tr>
<tr>
<td>From Air Handling Unit to Terminal Unit:</td>
<td>P</td>
<td>4”</td>
</tr>
<tr>
<td>From Single Zone AHU to Diffuser:</td>
<td>P</td>
<td>2”</td>
</tr>
<tr>
<td>From Terminal Unit to Diffuser:</td>
<td>P</td>
<td>1”</td>
</tr>
<tr>
<td>From Return Grille to Fan:</td>
<td>N</td>
<td>1”</td>
</tr>
<tr>
<td>From Return Fan to Relief Louver:</td>
<td>P</td>
<td>1”</td>
</tr>
<tr>
<td>From Exhaust Register to Exhaust Fan:</td>
<td>N</td>
<td>2”</td>
</tr>
</tbody>
</table>

4. **Sealing:** Seal ductwork and plenums as follows:

<table>
<thead>
<tr>
<th>Location</th>
<th>Seal Class</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outdoors</td>
<td>A</td>
<td>All transverse joint, longitudinal seams and duct wall penetrations.</td>
</tr>
<tr>
<td>Unconditioned Spaces</td>
<td>B</td>
<td>All transverse joints and longitudinal seams.</td>
</tr>
<tr>
<td>Conditioned Spaces including RA Plenums</td>
<td>C</td>
<td>Transverse joints</td>
</tr>
<tr>
<td></td>
<td></td>
<td>a. Apply duct sealer to inside of seams and joints. Do not use pressure sensitive tape as the primary sealant.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>b. All transverse joint, longitudinal seams and duct wall penetrations.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>c. All transverse joints and longitudinal seams.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>d. Transverse joints</td>
</tr>
</tbody>
</table>

5. **Clearance to earth:** Maintain minimum 4-inch separation between ductwork insulation and earth.

6. **Openings in Ductwork:** During installation protect the open ends of ducts to prevent debris and dirt from entering.

7. **Provide turning vanes in square elbows of low velocity supply and exhaust ductwork.**

8. **Collars:** Where exposed ducts pass through walls, floors, or ceilings, provide a tight-fitting, flanged sheetmetal collar around duct and tight against finished surface to cover opening and present a neat appearance. Lock collar to duct.

9. **Cross Breaking:** Cross-break low velocity rectangular sheetmetal ducts on all four sides. Cross break sheet metal between standing seams or reinforcing angles. The center of cross break shall be of the required height to assure surfaces being rigid. Do not cross-break high velocity plenum panels.

10. **Grilles Registers and Diffusers:** Install plumb, affix to general construction as appropriate, make air-tight connection to ductwork, and adjust air flow pattern to achieve appropriate velocities in the occupied zones. Request direction from Engineer if any question exists regarding proper air flow adjustment.

11. **Duct Thermometers:** Provide thermometers to indicate mixed air, outside air, and supply air of indoor air handling units over 2,500 cfm and where shown on the Drawings.

12. **Test Holes:** Provide test holes in ducts at locations where testing is required per Section 23 0593 and as requested by the T&B agent. Close test holes with rubber plugs. Reseal all insulated ductwork with the same insulation, jacket and vapor barrier material after T&B is complete.

13. **Closure Systems:**

   a. **Rigid Air Ducts:** Comply with UL 181A – Standard for Closure Systems for Use with Rigid Air Ducts and Air Connectors.
   b. **Flexible Air Ducts:** Comply with UL 181B – Standard for Closure Systems for Use with Flexible Air Ducts and Air Connectors.
14. Factory Made Air Ducts: Install in accordance with the terms of their listing and the manufacturer’s recommendations.

15. Acoustic Insulation: See Section 23 0700, HVAC Insulation. Fabricate ductwork so the dimensions indicated on the drawings are the clear dimensions for air flow inside the acoustic insulation.

16. Coordination with Building Construction

a. General: The drawings show the general intended configuration of the ductwork. Provide additional offsets where necessary to coordinate with the building construction or with the work of other disciplines. Transition ductwork as required at no change in contract price. Where this is necessary, submit for review and maintain the indicated flow areas.

b. Ductwork is frequently routed through bar joists and between bar joists. Coordinate duct locations with joist submittals prior to fabrication.

B. Hangers and Supports

1. Securely support ducts per SMACNA and UMC Table 6-7. Provide support at each concentrated load and at each change in direction. Provide supports on each side of rectangular ducts and equipment. Where vertical ducts pass through floors or roofs, support with angles or other steel members attached to minimum two opposite sides of duct. Size supports to rigidly support the ductwork. Provide lateral support.

2. Hangers for terminal units: Minimum four 1" x 1/8" galvanized steel straps or two angle trapeze supports.

3. Horizontal Round Ducts: 30 inches and larger in diameter: Provide 2" x 2" x 1/8" black steel rolled angle ring on 6-ft centers, and support from angle.

C. Plenums

1. Single Wall Plenums: Shop fabricated minimum 16 gauge galvanized sheet steel. Horizontal and vertical panels are to be fabricated of 2’ x 10’ sheets. Unless otherwise dimensioned on the Drawings, access door frames are not to exceed 16-3/4 inch width. Where door width exceeds 16-3/4 inches, vertical panels shall be fabricated around 2" x 2" x 1/4" angle. If the plenum height or width exceeds 9 feet, provide a 2-1/2" x 1/8" continuous galvanized steel strip between each horizontal and vertical seam. Provide high velocity cement at each joint during panel assembly. Panels are to be bolted as shown on the details or tack welded at the Contractor's option; however, enough panels must be bolted to allow removal of equipment from the plenums. Cover interior surfaces with 2-inch thick, acoustical lining.

a. Plenum Access Doors: Minimum two fastening devices that can be operated on either side of the door; these devices to be readily operated and moving parts to have bronze pins. All parts of the door shall be constructed of galvanized iron and shall be airtight. Latches: "Ventlock" No. 310 OAE.

2. Double Wall Plenums: Factory fabricated, Semco or equivalent. Submit shop drawings for review including overall configuration, construction details, access doors, erection drawings and structural calculations stamped by a registered structural engineer.
a. Factory fabricated, minimum 18 gauge galvanized steel outside, perforated galvanized steel inside, with 2-inch sound insulation between. Plenums downstream of final filters shall have solid inner panel.

b. Heat transfer coefficient shall not exceed 0.0575 BTUH/SF-F at 75 deg F mean temperature. Pressure Ratings: 12 in. wg positive and 10 in. wg negative.

c. Noise attenuation shall be as follows in decibels, re 10^{12} watts.

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<thead>
<tr>
<th>OCTAVE BAND</th>
<th>1</th>
<th>2</th>
<th>3</th>
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<td>1.03</td>
<td>0.84</td>
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3.2 DUCTWORK ACCESSORIES

A. Dampers: Install dampers with shafts horizontal. Locate dampers so that actuators are readily accessible. Verify that dampers operate smoothly.

1. Manual Dampers (Balancing Dampers): Damper Types D1 through D23 are all suitable for use as manual balancing dampers. Provide locking quadrants.

2. Automatic Applications: The following damper types may be used for automatic applications: D4, D5, D6, D7, D21, D22 and D23. Provide damper actuators per Section 23 0900.

B. Flexible Connectors: Provide flexible connectors at locations indicated on the drawings and at the inlet and outlet of each fan directly connected to duct system. Select flexible connectors appropriate for the application. Provide steel spring vibration isolators spanning across flexible connections of isolated fan housings to prevent blow-apart due to horizontal displacement of fan housings.

C. Access Doors: Provide as required for access to all components located within ductwork. Locate to facilitate access to such components. Size as appropriate. In addition to locations specifically called out on the drawings or elsewhere in these specs, provide access doors at the following: FDs, SMDs, FSDs, instrumentation mounted within ductwork, fan bearings.

D. Turning Vanes: Provide turning vanes in square elbows of all supply ducts. Single wall turning vanes may be used in ducts up to 1500 FPM and 24-inch vane length. Provide double wall turning vanes in ducts exceeding either of these criteria.

E. Roof Curbs and Equipment Support Rails: Coordinate the location of roof curbs and rails with the roof structure, ductwork distribution, and other work. Install after roof deck is installed but before roof is insulated. Mount curbs and rails securely to deck per manufacturer’s recommendations. Provide counterflashing as required.

F. Louvers: Coordinate louver size and construction with structural and architectural openings to assure proper fit. Securely fasten louver to internal structural members to withstand a force of 25 lb/sf plus a safety factor of 3.0.

G. Instrumentation: Install duct thermometers and filter gauges so they are easily readable from the operator level.
3.3 DAMPERS FOR FIRE AND SMOKE CONTROL

A. Select FDs, SMDs and FSDs as appropriate to the application. Dampers may be rectangular or round, and single-section or multi-section as required, but shall not be less than the duct sizes indicated on the drawings nor larger than the maximum sizes per the UL listing for a given style of damper. Provide transitions and sleeves as required.

1. FSDs may be used where SMDs are indicated provided they meet the required ratings of the indicated SMDs and provided the FSDs are installed in accordance with their listing.

B. Install dampers in accordance with their listing. Terminate acoustic lining at dampers as necessary to ensure proper damper operation. Install actuators and access doors on the side of the duct unless space conditions preclude this. Provide adequate clearance for proper operation, and minimum 36-inch clearance for servicing actuator.

1. When space conditions preclude installing actuators on the side, such components may be installed on the top or bottom of the duct provided good access to these components is maintained.

2. When size requires the use of multiple dampers, provide framing to ensure the dampers remain in place.

3. Provide a duct access door at each FD, SMD and FSD for inspection and maintenance. Provide minimum 1/2-inch high label, “SMOKE DAMPER,” “FIRE DAMPER,” or “FIRE/SMOKE DAMPER.”

C. Test all SMDs and FSDs after the system is installed to ensure proper operation based on both smoke and fire signals. Advise Owner minimum 2 weeks in advance and invite him to observe these tests. Submit a written report with a table which identifies each such damper (along with plans which indicate each such damper); gives its size, type and model number; the date on which it was tested; the test results; and places for the initials of the person performing test for the contractor and the person witnessing test for owner. Should any dampers fail to operate properly, service them and demonstrate proper operation. Reset all dampers when the testing is complete.

3.4 FILTERS AND FILTER GAUGES

A. Provide one set of MERV-7 temporary filters until testing and balancing is complete. Then immediately before the system is turned over to the Owner at the completion of the project, remove these filters and provide the specified filters.

3.5 GRILLES REGISTERS AND DIFFUSERS

A. Install grilles, registers & diffusers (GRDs) square with building construction. Mount sidewall GRDs minimum, 3-inches above floor level. If GRDs have provisions to adjust the direction of air flow, submit a written recommendation regarding the best direction for air flows, obtain written approval from the Owner’s Representative, and adjust GRDs accordingly.
B. Verify frame types with architectural RCPs prior to ordering GRDs.

3.6 CLOSEOUT ISSUES

A. Leakage Testing

1. Pressure test not less than 25% of the installed ductwork of each system rated at 3 in wg or more, either positive or negative pressure. Advise Owner’s Representative when systems will be ready for testing. For large systems separate tests may be made on different sections. The Owner’s representative will designate the sections to be tested, but not more than 24 hours in advance of test. Cap ends of ducts as required and provide equipment as required for testing.

2. Measure duct leakage per the SMACNA HVAC Duct Leakage Test manual. Leakage shall not exceed the following:

\[ L_{\text{max}} = C_L P^{0.65} \]

- \( L_{\text{max}} \) = maximum permitted leakage, cfm/100 sf of duct surface area
- \( C_L \) = Duct leakage class (cfm/100 sf at 1-inch wg)
  - = 6 for rectangular sheet metal, rectangular fiberglass, and round flexible ducts
  - = 3 for round and flat oval sheet metal or fiberglass ducts
- \( P \) = Test pressure. Test pressure shall match system pressure class.
3. If sample is defective, the contractor shall repair or modify the defective section and re-test it to demonstrate compliance. In addition, for each section which fails its original pressure test, the Owner’s Representative will designate an additional ductwork section of similar size, for the Contractor to test. This section will be in addition to 25% area originally planned to be tested.

4. Complete all leakage testing and repairs prior to concealing ducts.

5. Submit a test report that documents the test procedure and results. Include:
   a. Test equipment – model numbers, technical data, calibration data, etc.
   b. Drawings showing the extent of the systems tested.
   c. Test results.
   d. Dates, witnesses, and signatures of witnesses.

B. Cleaning

1. All ducts, coils, housing, registers, grilles, fans, etc., shall be clean when installed and shall be kept clean until the system is completed. As the various parts of the system are installed, they shall be wiped or blown clean and openings taped dust-tight with heavy paper or cardboard until the system is completed and ready for testing. At that time all covers and protective wrappings shall be removed. Where one has been torn or previously removed, the duct, coil, register, etc., shall be carefully cleaned of any dirt or dust that has entered the opening.

2. Before the ceiling is installed and final connections are made to the high velocity terminal units, it will be required that the fans be operated at full capacity to blow out dirt and debris from ducts. If it is not practical to use the main supply blower for this test, the ducts may be blown out in sections by a portable fan. After the ducts have been cleaned, the final connections shall be made to the high velocity units.

END OF SECTION 23 30 00
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General Conditions, Supplementary Conditions, and Division 1 Specification Sections apply to all Sections of Division 26.

B. The requirements listed under General Conditions and Supplementary Conditions and the General Requirements are applicable to this section and all subsequent sections of Division 26 and form a part of the contract.

C. Division 2, Site Work for Trenching, Backfilling and Compaction requirements.

D. Division 1, Coordination for additional requirements.

E. Division 1, Cutting and Patching for additional requirements.

F. Division 1, Submittals for additional requirements.

G. Division 5, Metal Fabrication for additional requirements.

H. Division 7, Firestopping for additional requirements.

I. Division 7, Joint Sealants for additional requirements.

J. Division 9, Painting for additional requirements.

1.2 SUMMARY

A. This Section includes general administrative and procedural requirements of electrical installations. The following administrative and procedural requirements are included in this Section to expand the requirements specified in Division 1:

1. Submittals
2. Coordination Drawings
3. Record Documents
4. Maintenance Manuals
5. Rough-Ins
6. Electrical Installations
7. Cutting and Patching
1.3 ELECTRICAL DIVISION INDEX

Section 26 05 00  Common Work Results for Electrical
Section 26 05 19  Low Voltage Electrical Power Conductors and Cables
Section 26 05 26  Grounding and Bonding for Electrical Systems
Section 26 05 29  Hangers and Supports for Electrical Systems
Section 26 05 33  Raceway and Boxes for Electrical Systems
Section 26 05 44  Sleeves and Sleeve Seals
Section 26 05 48  Vibration and Seismic Controls for Electrical Systems
Section 26 05 50  Installation Coordination
Section 26 05 53  Identification for Electrical Systems
Section 26 08 00  Electrical Facility Startup/Commissioning
Section 26 08 80  Electrical Acceptance Testing
Section 26 09 13  Lighting Control Equipment
Section 26 27 26  Wiring Devices
Section 26 51 13  Interior Lighting Fixtures, Lamps and Ballasts

1.4 CODES AND PERMITS

A. Perform electrical work in strict accordance with the applicable provisions of the National Electrical Code, Latest Edition; National Electric Safety Code, Latest Edition; the International Building Code, Latest Edition as adopted and interpreted by the State of New Mexico, local municipality (if applicable), and the National Fire Protection Association (NFPA Regulations), current adopted edition. Provide all materials and labor necessary to comply with rules, regulations and ordinances. Where the drawings and/or specifications indicate materials or construction in excess of code requirements, the drawings and/or specifications shall govern. The Contractor shall hold and save the Engineer free and harmless from liability of any nature or kind arising from his failure to comply with codes and ordinances.

B. Secure and pay for all permits necessary for performance of the work. Coordinate all work to be supplied and/or performed by the utility company. Such work may include, but is not limited to:
   1. Line extensions and relocations
   2. Addition or removal of utility poles and guy anchors
   3. Establishment or modification of easements and right-of-way agreements
   4. Switchgear
   5. Transformers
   6. Transclosures
   7. Metering enclosures and sockets
   8. Inspections
   9. Connections
   10. Temporary power services (to be fully paid by Contractor)

C. The following lists applicable codes and standards that, as a minimum, shall be followed.

   Applicable county and state electrical codes, laws and ordinances.
National Electrical Manufacturer's Association Standards
National Electrical Code
National Electrical Safety Code
Underwriters Laboratories, Inc. Standards
American National Standards Institute
American Society for Testing Materials Standards
Standards and requirements of local utility companies
National Fire Protection Association Standards
Institute of Electrical and Electronics Engineers Standards
Insulated Cable Engineers Association
Occupational Safety and Health Act
Uniform Fire Code
Americans with Disabilities Act
Commercial and Industrial Insulation Standards (MICA)

1.5 RECORD DRAWINGS

A. Maintain a complete and accurate set of marked up blue-line prints showing information on the installed location and arrangement of all electrical work, and in particular, where changes were made during construction. Use red color to indicate additions or corrections to prints, green color to indicate deletions, and yellow color to indicate items were installed as shown. Keep record drawings accurate and up-to-date throughout the construction period. Record drawings may be reviewed and checked by the Architect/Engineer during the construction and in conjunction with review and approval of monthly pay requests. Include copies of all addenda, RFT's, bulletins, and change orders neatly taped or attached to record drawing set. Transmit drawings to the Architect/Engineer at the conclusion of the project for delivery to the Owner's Representative.

B. Prepare record documents in accordance with the requirements in Division 1, Section "PROJECT CLOSEOUT." In addition to the requirements specified in Division 1, indicate installed conditions for:

1. Major raceway systems, size and location, for both exterior and interior; locations of control devices; distribution and branch electrical circuitry; and fuse and circuit breaker size and arrangements.
2. Equipment locations (exposed and concealed), dimensioned from prominent building lines.
3. Approved substitutions, Contract Modifications, and actual equipment and materials installed.

1.6 QUALIFICATIONS
A. Refer to Division 26 sections for installation and testing qualifications.

1.7 SUBSTITUTIONS
A. Refer to the requirements for substitutions in Division 01.
B. Equipment submitted for substitution must fit the space conditions leaving adequate room for maintenance around all equipment. A minimum of 36 inches, or more if required by Code, must be maintained clear in front of all electrical panels, starters, gutters, or other electrical apparatus. Submit drawings showing the layout, size and exact method of interconnection of conduit, wiring and controls, which shall conform to the manufacturer's recommendations and these specifications. The scale of these drawings shall be scale of Contract Drawings. The Contractor shall bear the excess costs, by any and all crafts, of fitting the equipment into the space and the system designated. Where additional labor or material is required to permit equipment submitted for substitution to function in an approved manner, this shall be furnished and installed by the Contractor without additional cost to the Owner.

1.8 PRIOR APPROVAL
A. The Engineer will review submittals for the following categories of electrical equipment prior to bid ("Prior Approvals"). The requirements for prior approval in Division 01 or other sections of this project manual / specification volume(s) shall not override this requirement.
   1. Interior lighting fixtures.
   2. Exterior lighting fixtures.
   3. Lighting controls.
B. For all other categories of electrical equipment that are not listed in the preceding paragraph, refer to the requirements for prior approval in Division 01.
C. Requests for proposed substitutions shall be accompanied with catalog and technical data. Actual equipment components and options shall be highlighted and any discrepancies with the specified equipment noted. Refer to Division 01 for other requirements related to prior approval submittals.

1.9 HAZARDOUS CONDITIONS
A. Refer to Division 01 requirements related to the treatment of parts or items that are potentially hazardous to building occupants, maintenance and operation personnel, or to the public.
1.10 DEFINITIONS

A. Definitions of terms will be found in the National Electrical Code.

B. Whenever a term is used in this Specification which is defined in the Code, the definition given will govern its meaning in this Specification.

C. Whenever a technical term is used which does not appear in the Code, the definition to govern its meaning in these Specifications will be found in the Standard Dictionary of Electrical and Electronic Terms, published by the Institute of Electrical and Electronics Engineers, 445 Hoes Lane, Piscataway, New Jersey 08855-1331.

D. "Provide" means furnish, install, connect and test unless otherwise noted.

1.11 SUBMITTALS

A. See Division 1 for all submission requirements.

1.12 MAINTENANCE MANUALS

A. Prepare maintenance manuals in accordance with Division 1, Section "PROJECT CLOSEOUT." In addition to the requirements specified in Division 1, include the following information for equipment items:

1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.

2. Manufacturer’s printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.

3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.

4. Servicing instructions and lubrication charts and schedules.

1.13 COORDINATION DRAWINGS

A. Prepare coordination drawings in accordance with Division 1, Section "PROJECT COORDINATION", to a scale of 1/4" = 1'-0" or larger; detailing major elements, components, and systems of electrical equipment and materials in relationship with other systems, installations, and building components. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including (but not necessarily limited to) the following:
1. Indicate the proposed locations of major raceway systems, equipment, and materials. Include the following:
   a. Clearances for servicing equipment, including space for equipment disassembly required for periodic maintenance.
   b. Equipment connections and support details
   c. Sizes and location of required concrete pads and bases.

2. Indicate scheduling, sequencing, movement, and positioning of large equipment into the building during construction.

3. Prepare floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.

4. Prepare reflected ceiling plans to coordinate and integrate installations, air outlets and inlets, light fixtures, communications systems components, sprinklers, and other ceiling-mounted devices.

1.14 USE OF CADD FILES

A. Under certain conditions, the Contractor will be permitted the use of the Engineer's CADD files for documentation of as-builts, submittals, or coordination drawings.

B. The Engineer shall be compensated for the time required to format the CADD files for delivery to the Contractor. Such work may include removal of title blocks, professional seals, calculations, proprietary information, etc.

C. The Contractor shall complete the enclosed License, Indemnity and Warranty Agreement, complete with contractor's name, address, and Contractor's Representative signature prior to request for CADD file usage.

1.15 DRAWINGS AND SPECIFICATIONS

A. Electrical drawings are diagrammatic, but shall be followed as closely as actual construction and work of the other sections shall permit. Size and location of equipment is drawn to scale wherever possible. Do not scale from electrical drawings.

B. Drawings and specifications are for the assistance and guidance of the Contractor. Exact locations, distances, and levels will be governed by the building. The Contractor shall make use of data in all the Contract Documents to verify information at the building site.

C. In any case where there appears to be a conflict between that which is shown on the electrical drawings, and that shown in any other part of the Contract Documents, the Contractor shall notify and secure directions from the Architect.

D. Drawings and specifications are intended to complement each other. Where a conflict exists between the requirements of the drawings and/or the specifications, request clarification. Do not proceed with work without direction.
E. The Architect shall interpret the drawings and the specifications. The Architect's interpretation as to the true intent and meaning thereof and the quality, quantity, and sufficiency of the materials and workmanship furnished thereunder shall be accepted as final and conclusive.

F. In the case of conflicts not clarified prior to the bidding deadline, use the most costly alternative (better quality, greater quantity, and larger size) in preparing the bid. A clarification will be issued to the successful bidder as soon as feasible after the award and, if appropriate, a deductive change order will be issued.

G. Where items are specified in the singular, this division shall provide the quantity as shown on drawings plus any spares or extras indicated on the drawings or in the specifications.

H. Investigate structural and finish conditions and arrange work accordingly. Provide all fittings, equipment, and accessories required for actual conditions.

1.16 SIMILAR MATERIALS

A. All items of a similar type shall be products of the same manufacturer.

B. Contractor shall coordinate among suppliers of various equipment to assure that similar equipment type is product of the same manufacturer.

C. Examples of similar equipment types include but are not limited to:
   1. Power Circuit Breakers
   2. Enclosed Case Circuit Breakers
   3. Batteries
   4. TVSS
   5. Motor Starters
   6. Transformers
   7. Panelboards
   8. Disconnects
   9. Fuses

1.17 DELIVERY, STORAGE AND HANDLING

A. Deliver products to the project properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification.

1.18 GUARANTEE-WARRANTY

A. See Division 1 for warranties for more information.
B. The following guarantee is a part of the specifications and shall be binding on the Contractor:

"The Contractor guarantees that this installation is free from ALL defects. He agrees to replace or repair any part of the installation which may fail within a period of one (1) year after date established below, provided that such failure is due to defects in the materials or workmanship or to failure to follow the specifications and drawings. Warranty of the Contractor-furnished equipment or systems shall begin on the date the system or equipment is placed in operation for beneficial use of the Owner or occupancy by the Owner, whichever occurs first; such date to be determined in writing by means of issuing a 'Certificate of Substantial Completion', AIA Form G704."

C. The extent of guarantees or warranties by Equipment and/or Materials Manufacturers shall not diminish the requirements of the Contractor's guarantee-warranty to the Owner.

D. All items of electrical equipment furnished and installed under Division 26 shall be provided with a full two (2) year parts and labor warranty.

PART 2 - PRODUCTS

2.1 QUALITY OF MATERIALS

A. All equipment and materials shall be new, and shall be the standard product of manufacturers regularly engaged in the production of electrical equipment, and shall be the manufacturer's latest design. Specific equipment, shown in schedules on drawings and specified herein, is to set forth a standard of quality and operation.

2.2 ALTITUDE RATINGS

A. Unless otherwise noted, all specified equipment capacities are for an altitude of 4,265 feet above sea level and adjustments to manufacturer's ratings must be made accordingly.

2.3 EQUIPMENT REQUIREMENTS

A. The electrical requirements for equipment specified or indicated on the drawings are based on information available at the time of design. If equipment furnished for installation has electrical requirements other than those indicated on the electrical drawings, make all adjustments to wire and conduit size, controls, over current protection and installation as required to accommodate the equipment supplied. Delineate all adjustments to the drawings reflecting the electrical system in a submittal to the Contract Administrator immediately upon knowledge of the required adjustment.
PART 3 - EXECUTION

3.1 COOPERATION WITH OTHER TRADES

A. Coordinate all work so that the construction operations can proceed without harm to the Owner from interference, delay, or absence of coordination. The Contractor shall be responsible for the size and accuracy of all openings.

3.2 DRAWINGS

A. The electrical drawings show the general arrangement of all lighting, power, special systems, equipment, etc., and shall be followed as closely as actual building construction and work of other trades will permit. Whenever discrepancies occur between plans and specifications, the most stringent shall govern. All Contract Documents shall be considered as part of the work. Coordinate with architectural, mechanical, and structural drawings. Because of the small scale of the electrical drawings, it is not possible to indicate all offsets, fittings and accessories which may be required. Provide all fittings, boxes, and accessories as may be required to meet actual conditions. Should conditions necessitate a rearrangement of equipment, such departures and the reasons, therefore, shall be submitted by the Contractor for review in the form of detailed drawings showing the proposed changes. No changes shall be made without the prior written approval. All changes shall be marked on record drawings.

B. Should any doubt or question arise in respect to the true meaning of the drawings or specifications, the question shall be submitted in writing.

C. Installation of all equipment shall be arranged to provide all clearances required for equipment operation, service, and maintenance, including minimum clearance, as defined by the National Electrical Code (NEC).

D. The Contractor's attention is directed to the unique architectural design features and consideration associated with this facility which will require significantly greater levels of coordination and cooperation for the work furnished and installed under Division 26 with the associated architectural, structural, and mechanical work than is normally necessary for a more typical facility.

E. The installation of all concealed electrical systems shall be carefully arranged to fit within the available space without interference with adjacent structural and mechanical systems.

3.3 ELECTRICAL INSTALLATIONS

A. General: Sequence, coordinate, and integrate the various elements of electrical system, materials, and equipment. Comply with the following requirements:

1. Coordinate electrical systems, equipment, and materials installation with all other building components.
2. Verify all dimensions by field measurements.
3. Arrange for chases, slots, and openings in all other building components during progress of construction, to allow for electrical installations.
4. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components as they are constructed.
5. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.
6. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum clearance possible.
7. Coordinate connection of electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
8. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Architect.
9. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components.
10. Install electrical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
11. Install access panel or doors where units are concealed behind finished surfaces.
12. Install systems, materials, and equipment giving right-of-way priority to systems requiring installation at a specified slope.

3.4 FIELD MEASUREMENTS

A. No extra compensation shall be claimed or allowed due to differences between actual dimensions, including dimensions of equipment, fixtures and materials furnished, and those indicated on the drawings. Contractor shall examine adjoining work, and shall report any work which must be corrected. Review of submittal data in accordance with paragraph "Submittals" shall in no manner relieve the Contractor of responsibility for the proper installation of the electrical work within the available space. Installation of equipment and systems within the building space shall be carefully coordinated by the Contractor.

3.5 EQUIPMENT SUPPORT

A. Provide support for equipment to the building structure. Provide all necessary structures, inserts, sleeves, firestops and hanging devices for installation of equipment. Coordinate installation of devices. Verify with the Architect that the devices and supports are adequate as intended and do not overload the building's structural components in any way.
3.6 PAINTING

A. All finish painting of electrical systems and equipment will be under "Painting," unless equipment is hereinafter specified to be painted.

B. All equipment shall be provided with factory applied standard finish, unless otherwise specified.

C. Touch-Up: If the factory finish on any equipment is damaged in shipment or during construction of the building, the equipment shall be refinished to the satisfaction of the Architect/Engineer.

3.7 SEISMIC SUPPORTS

A. The Contractor shall be responsible for all anchors and connections for the electrical work to the building structure to prevent damage of equipment and systems due to seismic activity.

B. See Section Division 1 for requirements for seismic supporting of electrical equipment and systems.

3.8 PROTECTION OF MATERIALS AND EQUIPMENT

A. The Contractor shall be responsible for the protection of all work, materials and equipment furnished and installed under this section of the specifications, whether incorporated in the building or not.

B. All items of electrical equipment shall be stored in a protected weatherproof enclosure prior to installation within the building, or shall be otherwise protected from the weather in a suitable manner approved by the Architect/Engineer.

C. The Contractor shall provide protection for all work and shall be responsible for all damage done to property, equipment and materials. Storage of materials within the building shall be approved by the Architect/Engineer prior to such storage.

D. Conduit openings shall be closed with caps or plugs, or covered to prevent lodgment of dirt or trash during the course of installation. At the completion of the work, fixtures, equipment and materials shall be cleaned and polished thoroughly and delivered in a condition satisfactory to the Architect/Engineer.

3.9 EXCAVATION

A. Provide all excavation, trenching and backfilling required.

B. Slope sides of excavations to comply with codes and ordinances. Shore and brace as required for stability of excavation.
3.10  ERECTION OF METAL SUPPORTS AND ANCHORAGE

A. Cut, fit, and place miscellaneous metal fabrications accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

B. Field Welding: Comply with AWS "Structural Welding Code."

3.11  ERECTION OF WOOD SUPPORTS AND ANCHORAGE

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorage accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

B. Select fastener sizes that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

3.12  APPLICATION OF JOINT SEALERS

A. General: Comply with joint sealer manufacturer’s printed application instructions applicable to products and applications indicated, except where more stringent requirements apply.


B. Immediately after sealant application and prior to time shinning or curing begins, tool sealants to form smooth, uniform beads; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

C. Firestopping Sealant: Provide sealant, including forming, packing, and other accessory materials, to fill openings around electrical services penetrating floors and walls, to provide fire-stops with fire-resistance ratings indicated for floor or wall assembly in which penetration occurs. Comply with installation requirements established by testing and inspecting agency.

3.13  INSTALLATION OF ACCESS DOORS

A. Set frames accurately in position and securely attached to supports, with face panels plumb and level in relation to adjacent finish surfaces.

B. Adjust hardware and panels after installation for proper operation.
3.14 CUTTING AND PATCHING

A. Perform cutting and patching in accordance with Division 1, Section "CUTTING AND PATCHING." In addition to the requirements specified in Division 1, the following requirements apply:

1. Perform cutting, fitting, and patching of electrical equipment and materials required to:

   a. Remove and replace defective Work.
   b. Remove and replace Work not conforming to requirements of the Contract Documents.
   c. Remove samples of installed Work as specified for testing.
   d. Install equipment and materials in existing structures.
   e. Upon written instructions from the Contracting Officer, uncover and restore Work to provide for Contracting Officer observation of concealed Work.

2. Cut, remove, and legally dispose of selected electrical equipment, components, and materials as indicated, including but not limited to removal of electrical items indicated to be removed and items made obsolete by the new Work.

3. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.

4. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.

5. During cutting and patching operations, protect adjacent installations.


3.15 MANUFACTURER'S INSTRUCTIONS

A. All equipment shall be installed in strict accordance with recommendations of the manufacturer. If such recommendations conflict with plans and specifications, the Contractor shall submit such conflicts to the Architect/Engineer who shall make such compromises as he deems necessary and desirable.

3.16 CONCRETE BASES AND HOUSEKEEPING PADS

A. Install concrete bases and housekeeping pads under all freestanding electrical equipment unless otherwise noted.

B. Contractor shall be responsible for the accurate dimensions of all pads and bases and shall furnish and install all anchor bolts, etc. Coordinate weight of concrete bases and housekeeping pads with the structural engineer.
C. All concrete bases and housekeeping pads shall conform to the requirements specified under Division 3, Concrete, portions of these specifications. Pad foundations shall be 4” high minimum, unless otherwise indicated on the drawings. Chamfer edges shall be 1”. Faces shall be free of voids and rubbed smooth with Carborundum block after stripping forms. Tops shall be level. Provide dowel rods or other required material in floor for lateral stability and anchorage.

3.17 TESTS

A. All tests shall be conducted in the presence of the designated and authorized Owner’s Representative. The Contractor shall notify the Architect/Engineer one week in advance of all tests. The Contractor shall furnish all necessary equipment, materials, and labor to perform the required tests.

3.18 OPERATION AND MAINTENANCE INSTRUCTIONS

A. The Contractor shall furnish the complete operating and maintenance instructions covering all units of electrical equipment herein specified together with parts lists. Furnish four (4) copies of all the literature; each shall be suitably bound in loose leaf book form.

B. Operating and maintenance manuals as required herein shall be submitted for review not less than two (2) weeks prior to the date scheduled for the Contractor to provide Operating and Maintenance Instructions to the Owner as specified herein.

C. Upon completion of all work and all tests, Contractor shall furnish the necessary skilled labor and helpers for operating the electrical systems and equipment for a period of five (5) days of eight (8) hours each. During this period, the Contractor shall instruct the Owner or his representative in the operations, adjustment and maintenance of all equipment furnished. Contractor shall provide at least two weeks notice in advance of this period, with a written schedule of each training session, the subject of the session, the Contractors’ representatives who plan to attend the session, and the time for each session.

D. The Contractor shall video tape the instruction and training sessions using a VHS camcorder, and at the completion and acceptance (by Owner and Architect) of the training sessions, the Contractor shall submit (2) copies of the video tape.

3.19 CERTIFICATIONS

A. Before receiving final payment, certify in writing that all equipment furnished and all work done is in compliance with all applicable codes mentioned in these specifications. Submit certifications and acceptance certificates to the Architect/Engineer including proof of delivery of O&M manuals, spare parts required, and equipment warranties which shall be bound with O&M manuals.
3.20 OPERATION PRIOR TO ACCEPTANCE

A. Operation of equipment and systems installed by the Contractor for the benefit of the Owner prior to substantial completion will be allowed providing a written agreement between the Owner and the Contractor has established warranty and other responsibilities to the satisfaction of both parties.

3.21 SITE VISITS AND OBSERVATION OF CONSTRUCTION

A. The Architect/Engineer will make periodic visits to the project site at various stages of construction in order to observe the progress and quality of various aspects of the Contractor’s work, in order to determine in general if such work is proceeding in accordance with the Contract Documents. This observation by the Architect/Engineer however, shall in no way release the Contractor from his complete responsibility to supervise, direct, and control all construction work and activities, nor shall the Architect/Engineer have authority over, or a responsibility to means, methods, techniques, sequences, or procedures of construction provided by the Contractor or for safety precautions and programs, or for failure by the Contractor to comply with all law, regulations, and codes.

END OF SECTION 26 05 00
TO: BRIDGERS & PAXTON CONSULTING ENGINEERS, INC.

PROJECT: _____________________________________________________________

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

Section: ___________  Page: ___________  Paragraph/Line: ___________  Specified Item: ___________

Proposed Substitution: ____________________________________________________________

Attach complete product description, drawings, photographs, performance and test data, and other information necessary for evaluation. Identify specific Model Numbers, finishes, options, etc.

1. Will changes be required to building design in order to properly install proposed substitutions?  YES □  NO □
   If YES, explain:

2. Will the undersigned pay for changes to the building design, including engineering and drawing costs, caused by requested substitutions?  YES □  NO □

3. List differences between proposed substitutions and specified item.

<table>
<thead>
<tr>
<th>Specified Item</th>
<th>Proposed Substitution</th>
</tr>
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4. Does substitution affect Drawing dimensions?  YES □  NO □

5. What affect does substitution have on other trades? ____________________________________________________________

6. Does the manufacturer’s warranty for proposed substitution differ from that specified?  YES □  NO □
   If YES, explain:

7. Will substitution affect progress schedule?  YES □  NO □
   If YES, explain:

8. Will maintenance and service parts be locally available for substitution?  YES □  NO □
   If YES, explain:

9. Is substitution identical in appearance and function to specialized product?  YES □  NO □

| Submitting Firm: ___________________________  Date: ___________  Address: ___________________________  Signature: ___________________________  Telephone: ___________________________ |

**For Engineer's Use Only**

Accepted: ___________________________  Not Accepted: ___________________________  Received Too Late: ___________________________.

By: ___________________________  Date: ___________.

Remarks: ___________________________.

3701 / 3702 / 3703 / 3704 / 3705
26 05 00 – COMMON WORK RESULTS FOR ELECTRICAL - 16
LICENSE, INDEMNITY AND WARRANTY AGREEMENT

BETWEEN: Bridgers & Paxton Consulting Engineers, Inc.
4600-C Montgomery Blvd NE
Albuquerque, New Mexico 87109

and the Contractor:

For use of CADD Database by the Contractor for:

PROJECT: ____________________________
LICENSE: ____________________________

1.1 LICENSE GRANT: The Contractor is granted use of the CADD Database for the specific purpose of preparing submittal documents for the Project. No other use of the CADD Database is granted. Title to the CADD Database is not transferred to the Contractor.

1.2 COPYING RESTRICTIONS: The Contractor may copy the CADD Database in whole or in part, only for backup and archival purposes and for use by the Contractor’s Subcontractors. All of the Contractor’s Subcontractors who receive a copy of the CADD Database in whole or in part shall be bound by the terms and conditions of this Agreement.

1.3 TRANSFER OF CADD DATABASE: The Contractor may not transfer the CADD Database to any other party other than as specified in Section 1.2 of this Agreement.

WARRANTY

2.1 DATABASE WARRANTY: Bridgers & Paxton Consulting Engineers, Inc. disclaims all warranties with regard to the database supplied hereunder, including all implied warranties of fitness. Bridgers & Paxton Consulting Engineers, Inc., disclaims all obligations or liabilities for damages, including, but not limited to, consequential damages rising out of or in connection with the use of performance of the database.

INDEMNITY

3.1 INDEMNITY: The Contractor recognizes that the use of the database will be at the Contractor’s sole risk and without any liability, risk or legal exposure by Bridgers & Paxton Consulting Engineers, Inc. The Contractor recognizes that it is impossible for the Engineer to assure the accuracy, completeness and sufficiency of such information, either because it is impossible to verify, or because of errors or omissions which may have occurred in assembling the information the Engineer is providing. Furthermore, in that these CADD Database files are considered to be information furnished to the Contractor by others, it shall be the Contractor’s sole responsibility to verify dimensions in the drawings prior to using these database files for his intended purpose. Furthermore, the Contractor shall, to the fullest extent permitted by law, defend, indemnify and hold harmless Bridgers & Paxton Consulting Engineers, Inc., from all claims, damages, losses, and attorney fees arising out of or resulting from the use of the database.
3.2 COMPENSATION: The Contractor shall compensate Bridgers & Paxton for the time required to format the CADD files for delivery to the Contractor. Such work may include removal of title blocks, professional seals, calculations, proprietary information, etc. No time shall be expended making any substantive changes to the drawings. The cost for this time will be billed at the rate of $75.00 / Hour. It is not anticipated that more than four (4) hours will be required to complete this task. An invoice will be generated and delivered with the drawing files. Payment for the services shall be made within thirty (30) days of the receipt of the invoice.

ACKNOWLEDGMENT

4.1 ACKNOWLEDGMENT: The Contractor acknowledges that (s)he has read this Agreement, understands it, and agrees to be bound by its terms and conditions.

CONTRACTOR’S REPRESENTATIVE

Authorized Signature: __________________________________________________________

Title: ________________________________________________________________________

Date: ________________________________________________________________________

BRIDGERS & PAXTON CONSULTING ENGINEERS, INC.

Authorized Signature: __________________________________________________________

Title: ________________________________________________________________________

Date: ________________________________________________________________________
SECTION 26 05 19
LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes building wires and cables and associated splices, connectors, and terminations for wiring systems rated 600 volts and less.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 26, Section 26 05 29, Hangers and Supports for Electrical Systems for supports and anchors for fastening cable directly to building finishes.
2. Division 26, Section 26 05 53, Identification for Electrical Systems for insulation color coding and wire and cable markers.
3. Division 28, Section 28 05 13, Conductors and Cables for Electronic Safety and Security.

1.3 SUBMITTALS

A. Field test reports indicating and interpreting test results relative to compliance with performance requirements of testing standard.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: In addition to the requirements specified in Division 1 Section "Quality Control Services," an independent testing agency shall meet OSHA criteria for accreditation of testing laboratories, Title 29, Part 1907, or shall be a full member company of the International Electrical Testing Association (NETA).

1. Testing Agency's Field Supervisor Qualifications: A person currently certified by the NETA National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.

B. Listing and Labeling: Provide products specified in this Section that are listed and labeled.

1. The Terms "Listed and Labeled": As defined in the National Electrical Code, Article 100.
C. Comply with NFPA 70 National Electrical Code for components and installation.

1.5 SEQUENCING AND SCHEDULING

A. Coordination: Coordinate layout and installation of cable with other installations.

B. Revise locations and elevations from those indicated as required to suit field conditions.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver wire and cable according to NEMA WC-26.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Wires and Cables:
   b. Brand-Rex Cable Systems, Brintec Corp.
   c. Carol Cable Company, Inc.
   d. Senator Wire & Cable Co.
   e. Southwire Co.

2. Connectors for Wires and Cables:
   a. AMP, Inc.
   b. Anderson, Square D Co.
   c. Electrical Products Division, 3M Co.
   d. O-Z/Gedney Unit, General Signal

2.2 BUILDING WIRES AND CABLES

A. UL listed building wires and cables with conductor material, insulation type, cable construction, and rating as specified in Part 3 "Applications" Article.

B. Rubber Insulation: Comply with NEMA WC 3.

C. Thermoplastic Insulation: Comply with NEMA WC 5.

D. Cross-Linked Polyethylene Insulation: Comply with NEMA WC 7.
E. Ethylene Propylene Rubber Insulation: Comply with NEMA WC 8.

F. Conductor Material: Copper, or Aluminum is allowed for feeders (only) rated 100 Amps or higher.

G. Solid conductor for 10 AWG and smaller; stranded conductor for larger than 10 AWG. Stranded conductor for controls and connections subject to vibration.

2.3 CONNECTORS AND SPLICES

A. UL-listed factory-fabricated wiring connectors of size, ampacity rating, material, and type and class for application and for service indicated. Select to comply with Project's installation requirements and as specified in Part 3 "Applications" Article.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine raceways and building finishes to receive wires and cables for compliance with installation tolerances and other conditions. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Service Entrance: Type RHW or THWN, copper conductor, in raceway.

B. Feeders: Type THHN/THWN.

C. Branch Circuits:

1. Type THHN-THWN, single conductors in raceway.

D. Fire Alarm Circuits: Power-limited fire protective signaling circuit cable, and Type THHN/THWN, copper conductor, in raceway.

E. Class 1 Control Circuits: Type THHN/THWN, copper conductor, in raceway.

F. Class 2 Control Circuits: Power-limited tray cable, in cable tray, Power-limited cable, concealed in building finishes.

G. Ampacity: Use 60ºC rating only for sizes #14 AWG through #1 AWG unless otherwise noted.
3.3 INSTALLATION

A. Install wires and cables as indicated, according to manufacturer's written instructions and the NECA "Standard of Installation."

B. Pull conductors into raceway simultaneously where more than one is being installed in same raceway.
   1. Use pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation.
   2. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.

C. Install exposed cable, parallel and perpendicular to surfaces or exposed structural members, and follow surface contours where possible.

D. Conductor Splices: In branch circuits and if kept to minimum. No splices in services or feeders.
   1. Install splices and tapes that possess equivalent or better mechanical strength and insulation ratings than conductors being spliced.
   2. Use splice and tap connectors that are compatible with conductor material.
   3. Crimp type "quick connect" style wire connectors are not permitted.

E. Wiring at Outlets: Install with at least 12 inches of slack conductor at each outlet.

F. Connect outlets and components to wiring and to ground as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals according to tightening torques specified in UL Standard 486A.

3.4 FIELD QUALITY CONTROL

A. Testing: Upon installation of wires and cables and before electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
   1. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA Standard ATS, Section 7.3.1. Certify compliance with test parameters.

B. Correct malfunctioning products at site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units, and retest.

END OF SECTION 26 05 19
SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes grounding of electrical systems and equipment. Grounding requirements specified in this Section may be supplemented by special requirements of systems described in other Sections.

B. Related Sections include the following:
   1. Division 26, Section 26 05 43, Underground Ducts & Raceways for Electrical Systems for ground test wells.
   2. Division 26, Section 26 41 13, Lightning Protection for Structures, for additional grounding and bonding materials.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Qualification Data: For firms and persons specified in ‘Quality Assurance’ Article.

C. Field Test Reports: Submit written test reports to include the following:
   1. Test procedures used.
   2. Test results that comply with requirements.
   3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: Testing agency as defined by OSHA in 29 CFR 1910.7 or a member company of the International Electrical Testing Association and that is acceptable to authorities having jurisdiction.

1. Testing Agency’s Field Supervisor: Person currently certified by the International Electrical Testing Association to supervise onsite testing specified in Part 3.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1. Comply with UL 467.

C. Comply with NFPA 70; for overhead line construction and medium voltage underground construction, comply with IEEE C2.

D. Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the work include, but are not limited to, the following:

1. Grounding Conductors, Cables, Connectors, and Rods:

   a. Apache Grounding/Erico Inc.
   b. Boggs, Inc.
   c. Chance/Hubbell
   d. Copperweld Corporation
   e. Dossert Corporation
   f. Erico Inc., Electrical Products Group
   g. Framatome Connectors/Burndy Electrical
   h. Galvan Industries, Inc.
   i. Harger Lightning Protection, Inc.
   j. Hastings Fiber Glass Products, Inc.
   k. Heary Brothers Lightning Protection Co.
   l. Ideal Industries, Inc.
   m. Ilsco
   n. Kearney/Cooper Power Systems
   o. Korns: C.C. Korns Co., Division of Robroy Industries
   p. Lightning Master Corporation
q. Lyncole XIT Grounding
r. O-Z/Gedney Company; a business of the EGS Electrical Group
s. Raco, Inc., Division of Hubbell
t. Robbins Lightning, Inc.
u. Salisbury: W.H. Salisbury & Company
v. Superior Grounding Systems, Inc.
w. Thomas & Betts, Electrical

2.2 GROUNDING CONDUCTORS

A. For insulated conductors, comply with Division 26, Section 26 0519, Low-Voltage Electrical Power.

B. Equipment Grounding Conductors: Insulated with green colored insulation.

C. Isolated Ground Conductors: Insulated with green colored insulation with yellow stripe. On feeders with isolated ground, use colored tape, alternating bands of green and yellow tape to provide a minimum of three bands of green and two bands of yellow.

D. Grounding Electrode Conductors: Stranded cable.

E. Underground Conductors: Bare, tinned, stranded, unless otherwise indicated.

F. Bare Copper Conductors: Comply with the following:

G. Copper Bonding Conductors: As follows:
   1. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG copper conductor, 1/4 inch in diameter.
   2. Bonding Conductor: No. 4 or No. 6 AWG, stranded copper conductor.
   3. Bonding Jumper: Bare copper tape, braided bare copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
   4. Tinned Bonding Jumper: Tinned copper tape, braided copper conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.

H. Ground Conductor and Conductor Protector for Wood Poles: As follows:
   1. No. 4 AWG minimum, soft drawn copper conductor.
   2. Conductor Protector: Half-round PVC or wood molding. If wood, use pressure treated fir, cypress or cedar.

I. Grounding Bus: Bare, annealed copper bars of rectangular cross section, with insulators.
2.3 CONNECTOR PRODUCTS

A. Comply with IEEE 837 and UL 467; listed for use for specific types, sizes, and combinations of conductors and connected items.

B. Bolted Connectors: Bolted pressure type connectors, or compression type.

C. Welded Connectors: Exothermic welded type, in kit form, and selected per manufacturer’s written instructions.

D. Irreversible Compression Connectors: In kit form, selected per manufacturer’s written instructions.

2.4 GROUNDING ELECTRODES

A. Ground Rods: Sectional type copper-clad steel.
   1. Size: 3/4 by 120 inches in diameter.

B. Chemical Electrodes: UL listed, copper tube, straight or L-shaped, filled with nonhazardous chemical salts, terminated with a 4/0 bare conductor. Provide backfill material recommended by manufacturer.

C. Test Wells: Provide handholes as specified in Division 26, Section 26 0543, Underground Ducts and Raceways for Electrical Systems.

D. Ground Bar: 12 inches long or greater length as indicated on the drawings, fabricated from 1/4 inch thick, 4 inch wide copper stock with 1.75 inch x 1.75 inch NEMA bolt hole pattern. Mount ground bar on 2700V standoff insulators.

E. Ground Electrode Backfill Material:
   1. Bentonite clay or equivalent commercial ground enhancement backfill material for ground rods and cable type electrodes.
   2. Backfill material, when at 300% moisture content ((weight of water/weight of material) x 100) shall have a resistivity of approximately 250 ohm-cm and a pH of 8 to 10.

PART 3 - EXECUTION

3.1 APPLICATION

A. Use only copper conductors for both insulated and bare grounding conductors.

B. In raceways, use insulated equipment grounding conductors.
C. Exothermic-Welded Connections or Irreversible Compression Connections: Use for connections to structural steel and for underground connections, except those at test wells.

D. Equipment Grounding Conductor Terminations: Use bolted pressure clamps.

E. Ground Rod Clamps at Test Wells: Use bolted pressure clamps with at least two (2) bolts.

F. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
   1. Use insulated spacer; space one-inch from wall and support from wall six-inches above finished floor, unless otherwise indicated.
   2. At doors, route the bus up to the top of the door frame, across the top of the doorway, and down to the specified height above the floor.

G. Underground Grounding Conductors: Use copper conductor, No. 2/0 AWG minimum. Bury at least 24 inches below grade or bury 12 inches above duct bank when installed as part of the duct bank.

3.2 EQUIPMENT GROUNDING CONDUCTORS

A. Comply with NFPA 70, Article 250 for types, sizes, and quantities of equipment grounding conductors, unless specific types, larger sizes, or more conductors than required by NFPA 70 are indicated.

B. Install insulated equipment grounding conductors in all feeders and circuits.

C. Busway Supply Circuits: Install insulated equipment grounding conductor from the grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.

D. Computer Outlet Circuits: Install insulated equipment grounding conductor in branch circuit runs from computer area power panels or power distribution units.

E. X-Ray Equipment Circuits: Install insulated equipment grounding conductor in circuits supplying x-ray equipment.

F. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.
G. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate equipment grounding conductor. Isolate equipment grounding conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service, unless otherwise indicated.

H. Nonmetallic Raceways: Install an equipment grounding conductor in nonmetallic raceways unless they are designated for telephone or data cables.

I. Air Duct Equipment Circuits: Install an equipment grounding conductor to duct mounted electrical devices operating at 120V and more, including air cleaners and heaters. Bond conductor to each unit and to air duct.

J. Water Heater, Heat Tracing, and Antifrost heating Cables: Install a separate equipment grounding conductor to each electric water heater, heat tracing, and antifrost heating cable. Bond conductor to heater units, piping, connected equipment and components.

K. Signal and Communication Systems: For telephone, alarm, voice and data, and other communication systems, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.

   1. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4 x 2 x 12 inch grounding bus.
   2. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

L. Metal Poles Supporting Outdoor Lighting Fixtures: Provide a grounding electrode in addition to installing a separate equipment grounding conductor with supply branch circuit conductors.

M. Common Ground Bonding with Lightning Protection System: Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

3.3 MAIN GROUNDING ELECTRODE SYSTEM

A. Use the building concrete grade beam to make a concrete encased main grounding electrode; conductor shall be a copper ground cable:

   1. Make one reinforcing bar, located in the bottom one-third of the footing, electrically continuous around the entire perimeter of the building. The reinforcing bar shall be at least #6 size and uncoated. Bond the reinforcing bars together by exothermically welding #4/0 AWG ground cable across splices.
B. Where it is not possible to use the building grade beam as a concrete encased electrode, or the main grounding electrode must be supplemented, use the following made electrodes:

1. Install a counterpoise of #4/0 AWG ground cable located 2 feet outside the building perimeter and at least 2 feet below grade. Encase the counterpoise in a 2 inch slurry envelope of ground electrode backfill material.

3.4 COUNTERPOISE

A. Ground the steel framework of the building with a driven ground rod at the base of every corner column and at intermediate exterior columns at distances not more than 60 feet apart. Provide a grounding conductor (counterpoise), electrically connected to each ground rod and to each steel column, extending around the perimeter of the building. Use tinned copper conductor not less than No. 2/0 AWG for counterpoise and for tap to building steel. Bury counterpoise not less than 18 inches below grade and 24 inches from building foundation.

3.5 INSTALLATION

A. Ground Rods: Install at least three (3) rods spaced at least one rod length from each other and located at least the same distance from other grounding electrodes.

1. Drive ground rods until tops are 2 inches below finished floor or final grade, unless otherwise indicated.
2. Interconnect ground rods with grounding electrode conductors. Use exothermic welds, except at test wells and as otherwise indicated. Make connections without exposing steel or damaging copper coating.

B. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

1. Where grounding conductors are required in PVC conduit or bare, do not completely encircle conduit or conductor with steel clamp or other steel devices.
2. Where grounding conductor is routed in steel conduit, bond both ends of conduit to grounding conductor with full size conductor.

C. Bonding Straps and Jumpers: Install so vibration by equipment mounted on vibration isolation hangers and supports is not transmitted to rigidly mounted equipment. Use exothermic welded connectors for outdoor locations, unless a disconnect type connection is required; then, use a bolted clamp. Bond straps directly to the basic structure taking care not to penetrate any adjacent parts. Install straps only in locations accessible for maintenance.
D. Metal Water Service Pipe: Provide insulated copper grounding conductors, in conduit, from building’s main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes by grounding clamp connectors. Where a dielectric main water fitting is installed, connect grounding conductor to street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.

E. Water Meter Piping: Use braided type bonding jumpers to electrically bypass water meters. Connect to pipe with grounding clamp connectors.

F. Bond interior metal piping systems and metal air ducts to equipment grounding conductors of associated pumps, fans blowers, electric heaters, and air cleaners. Use braided type bonding straps.

G. Bond each aboveground portion of gas piping system upstream from equipment shutoff valve.

H. Install one test well for each service at the ground rod electrically closest to the service entrance. Set top of well flush with finished grade or floor.

I. Ufer Ground (Concrete Encased Grounding Electrode): Fabricate according to NFPA 70, Paragraph 250-81(c), using a minimum of 20 feet of bare copper conductor not smaller than No. 4 AWG. If concrete foundation is less than 20 feet long, coil excess conductor within the base of the foundation. Bond grounding conductor to reinforcing steel in at least four (4) locations and to anchor bolts. Extend grounding conductor below grade and connect to building grounding grid or to a grounding electrode external to concrete.

J. Electrical Room Grounding Bus: Space 1 inch from wall and support from wall 6 inches above finished floor, except as otherwise indicated.

3.6 CONNECTIONS

A. General: Make connections so galvanic action or electrolysis possibility is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer to order of galvanic series.
2. Make connections with clean, bare metal at points of contact.
4. Make aluminum-to-galvanized steel connections with tin plated copper jumpers and mechanical clamps.
5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
B. Exothermic Welded Connections: Comply with manufacturer’s written instructions. Welds that are puffed up or that show convex surfaces indicating improper cleaning are not acceptable.

C. Equipment Grounding Conductor Terminations: For No. 8 AWG and larger, use pressure type grounding lugs. No. 10 AWG and smaller grounding conductors may be terminated with winged pressure type connectors.

D. Non-contact Metal Raceway Terminations: If metallic raceways terminate at metal housings without mechanical and electrical connection to housing, terminate each conduit with grounding bushing. Connect grounding bushings with a bare grounding conductor to grounding bus or terminal in housing. Bond electrically non-continuous conduits at entrances and exits with grounding bushings and bare grounding conductors, unless otherwise indicated.

E. Connections at Test Wells: Use compression type connectors on conductors and make bolted and clamped type connections between conductors and ground rods.

F. Common Ground Bonding with Lightning Protection System: Bond electric power system ground directly to lightning protection system grounding conductor at closest point to electric service grounding electrode. Use bonding conductor sized same as system grounding conductor and install in conduit.

G. Tighten screws and bolts for grounding and bonding connectors and terminals according to manufacturer’s published torque tightening values. If manufacturer’s torque values are not indicated, use those specified in UL 486A.

H. Compression Type Connections: Use hydraulic compression tools to provide correct circumferential pressure for compression connectors. Use tools and dies recommended by connector manufacturer. Provide embossing die code or other standard method to make a visible indication that a connector has been adequately compressed on grounding conductor.

I. Moisture Protection: If insulated grounding conductors are connected to ground rods or grounding buses, insulate entire area of connection and seal against moisture penetration of insulation and cable.

3.7 UNDERGROUND DISTRIBUTION SYSTEM GROUNDING

A. Duct Banks: Install a grounding conductor with at least 50 percent ampacity of the largest phase conductor in the duct bank, or if conductor size is not known use 4/0 AWG.
B. Manholes and Handholes: Install a driven ground rod close to wall and set rod depth so 4 inches will extend above finished floor. If necessary, install ground rod before manhole is placed and provide a No. 1/0 AWG bare, tinned copper conductor from ground rod into manhole through a waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with a double wrapping of pressure sensitive tape or heat shrunk insulating sleeve from 2 inches above to 6 inches below concrete. Seal floor opening with waterproof, non-shrink grout.

C. Connections to Manhole Components: Connect exposed metal parts, such as inserts, cable racks, pulling irons, ladders, and cable shields within each manhole or handhole, to ground rod or grounding conductor. Make connections with No. 4 AWG minimum, stranded, hard drawn copper conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields as recommended by manufacturer of splicing and termination kits.

D. Pad Mounted Transformers and Switches: Install two (2) ground rods and counterpoise circling pad. Ground pad mounted equipment and non-current carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Use tinned copper conductor not less than No. 2 AWG for counterpoise and for taps to equipment ground pad. Bury counterpoise not less than 18 inches below grade and 6 inches from the foundation.

3.8 FIELD QUALITY CONTROL

A. Testing: Perform the following field quality control testing:

1. After installing grounding system, but before permanent electrical circuitry has been energized, test for compliance with requirements.
2. Test completed grounding system at each location where a maximum ground resistance level is specified, at service disconnect enclosure grounding terminal, and at ground test wells. Measure ground resistance not less than two (2) full days after the last trace of precipitation, and without the soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests, by the fall of potential method according to IEEE 81.
3. Provide drawings locating each ground rod and ground rod assembly and other grounding electrodes, identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

   a. Equipment Rated 500 kVA and Less: 10 ohms
   b. Equipment Rated 500 to 1000 kVA: 5 ohms
   c. Equipment Rated More Than 1000 kVA: 3 ohms
   d. Substations & Pad Mounted Switching Equipment: 5 ohms
   e. Manhole Grounds: 10 ohms
4. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

3.9 GRADING AND PLANTING

A. Restore surface features, including vegetation, at areas disturbed by work of this section. Re-establish original grades, unless otherwise indicated. If sod has been removed, replace it as soon as possible after backfilling is completed. Restore areas disturbed by trenching, storing of dirt, cable laying, and other activities to their original condition. Include application of topsoil, fertilizer, lime, seed, sod, sprig, and mulch. Comply with Division 2, Section ‘Landscaping’. Maintain restored surfaces. Restore disturbed paving as indicated.

END OF SECTION 26 05 26
SECTION 26 05 29
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

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

1.2 SUMMARY
A. This Section includes secure support from the building structure for electrical items by means of hangers, supports, anchors, sleeves, inserts, seals, and associated fastenings.
B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 26, Section 26 05 00, Common Work Results for Electrical.
   2. Division 5, Section Metal Fabrications for requirements for miscellaneous metal items involved in supports and fastenings.
   3. Refer to other Division 26 sections for additional specific support requirements that may be applicable to specific items.

1.3 SUBMITTALS
A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
B. Product data for each type of product specified.
   1. Hanger and support schedule showing manufacturer's figure number, size, spacing, features, and application for each required type of hanger, support, sleeve, seal, and fastener to be used.
C. Shop drawings indicating details of fabricated products and materials.
D. Engineered Design consisting of details and engineering analysis for supports for the following items:

1.4 QUALITY ASSURANCE
A. Electrical Component Standard: Components and installation shall comply with NFPA 70, National Electrical Code.
B. Electrical components shall be listed and labeled by UL, ETL, CSA, or other approved, nationally recognized testing and listing agency that provides third-party certification follow-up services.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work, shall include the following:

1. Slotted Metal Angle and U-Channel Systems:
   a. Allied Tube & Conduit
   b. American Electric
   c. B-Line Systems, Inc.
   d. Cinch Clamp Co., Inc.
   e. GS Metals Corp.
   f. Haydon Corp.
   g. Kin-Line, Inc.
   h. Unistrut Diversified Products

2. Conduit Sealing Bushings:
   a. Bridgeport Fittings, Inc.
   b. Cooper Industries, Inc.
   d. GS Metals Corp.
   f. Madison Equipment Co.
   g. L.E. Mason Co.
   h. O-Z/Gedney
   i. Producto Electric Corp.
   j. Raco, Inc.
   k. Red Seal Electric Corp.
   l. Spring City Electrical Mfg. Co.
   m. Thomas & Betts Corp.

2.2 COATINGS

A. Coating: Supports, support hardware, and fasteners shall be protected with zinc coating or with treatment of equivalent corrosion resistance using approved alternative treatment, finish, or inherent material characteristic. Products for use outdoors shall be hot-dip galvanized.
2.3 MANUFACTURED SUPPORTING DEVICES

A. Raceway Supports: Clevis hangers, riser clamps, conduit straps, threaded C-clamps with retainers, ceiling trapeze hangers, wall brackets, and spring steel clamps.

B. Fasteners: Types, materials, and construction features as follows:
   1. Expansion Anchors: Carbon steel wedge or sleeve type.
   2. Toggle Bolts: All steel springhead type.

C. Conduit Sealing Bushings: Factory-fabricated watertight conduit sealing bushing assemblies suitable for sealing around conduit, or tubing passing through concrete floors and walls. Construct seals with steel sleeve, malleable iron body, neoprene sealing grommets or rings, metal pressure rings, pressure clamps, and cap screws.

D. Cable Supports for Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug for non-armored electrical cables in riser conduits. Provide plugs with number and size of conductor gripping holes as required to suit individual risers. Construct body of malleable-iron casting with hot-dip galvanized finish.

E. U-Channel Systems: 16-gauge steel channels, with 9/16-inch-diameter holes, at a minimum of 8 inches on center, in top surface. Provide fittings and accessories that mate and match with U-channel and are of the same manufacture.

2.4 FABRICATED SUPPORTING DEVICES

A. General: Shop or field fabricated supports or manufactured supports assembled from U-channel components.

B. Steel Brackets: Fabricated of angles, channels, and other standard structural shapes. Connect with welds and machine bolts to form rigid supports.

C. Pipe Sleeves: Provide pipe sleeves of one of the following:
   1. Sheetmetal: Fabricate from galvanized sheetmetal; round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate sleeves from the following gauge metal for sleeve diameter noted:
      a. 3-inch and smaller: 20-gauge
      b. 4-inch to 6-inch: 16-gauge
      c. over 6-inch: 14-gauge
   2. Steel Pipe: Fabricate from Schedule 40 galvanized steel pipe.
PART 3 - EXECUTION

3.1 INSTALLATION

A. Install supporting devices to fasten electrical components securely and permanently in accordance with NEC requirements.

B. Coordinate with the building structural system and with other electrical installation.

C. Raceway Supports: Comply with the NEC and the following requirements:

1. Conform to manufacturer's recommendations for selection and installation of supports.
2. Strength of each support shall be adequate to carry present and future load multiplied by a safety factor of at least four. Where this determination results in a safety allowance of less than 200 lbs, provide additional strength until there is a minimum of 200 lbs safety allowance in the strength of each support.
3. Install individual and multiple (trapeze) raceway hangers and riser clamps as necessary to support raceways. Provide U-bolts, clamps, attachments, and other hardware necessary for hanger assembly and for securing hanger rods and conduits.
4. Support parallel runs of horizontal raceways together on trapeze-type hangers.
5. Support individual horizontal raceways by separate pipe hangers. Spring steel fasteners may be used in lieu of hangers only for 1-1/2-inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings only. For hanger rods with spring steel fasteners, use 1/4-inch-diameter or larger threaded steel. Use spring steel fasteners that are specifically designed for supporting single conduits or tubing.
6. Space supports for raceways in accordance with Table I of this section. Space supports for raceway types not covered by the above in accordance with NEC.
7. Support exposed and concealed raceway within 1 foot of an unsupported box and access fittings. In horizontal runs, support at the box and access fittings may be omitted where box or access fittings are independently supported and raceway terminals are not made with chase nipples or threadless box connectors.
8. In vertical runs, arrange support so the load produced by the weight of the raceway and the enclosed conductors is carried entirely by the conduit supports with no weight load on raceway terminals.

D. Vertical Conductor Supports: Install simultaneously with installation of conductors.

E. Miscellaneous Supports: Support miscellaneous electrical components as required to produce the same structural safety factors as specified for raceway supports. Install metal channel racks for mounting cabinets, panelboards, disconnects, control enclosures, pull boxes, junction boxes, transformers, and other devices.

F. In open overhead spaces, cast boxes threaded to raceways need not be supported separately except where used for fixture support; support sheetmetal boxes directly from the building structure or by bar hangers. Where bar hangers are used, attach the bar to raceways on opposite sides of the box and support the raceway with an approved type of fastener not more than 24 inches from the box.
G. Sleeves: Install in concrete slabs and walls and all other fire-rated floors and walls for raceways and cable installations. For sleeves through fire rated-wall or floor construction, apply UL listed firestopping sealant in gaps between sleeves and enclosed conduits and cables.

H. Conduit Seals: Install seals for conduit penetrations of slabs on grade and exterior walls below grade and where indicated. Tighten sleeve seal screws until sealing grommets have expanded to form watertight seal.

I. Fastening: Unless otherwise indicated, fasten electrical items and their supporting hardware securely to the building structure, including but not limited to conduits, raceways, cables, cable trays, busways, cabinets, panelboards, transformers, boxes, disconnect switches, and control components in accordance with the following:

1. Fasten by means of wood screws or screw-type nails on wood, toggle bolts on hollow masonry units, concrete inserts or expansion bolts on concrete or solid masonry, and machine screws, welded threaded studs, or spring-tension clamps on steel. Threaded studs driven by a powder charge and provided with lock washers and nuts may be used instead of expansion bolts and machine or wood screws. Do not weld conduit, pipe straps, or items other than threaded studs to steel structures. In partitions of light steel construction, use sheetmetal screws.

2. Holes cut to depth of more than 1-1/2 inches in reinforced concrete beams or to depth of more than 3/4 inch in concrete shall not cut the main reinforcing bars. Fill holes that are not used.

3. Ensure that the load applied to any fastener does not exceed 25 percent of the proof test load. Use vibration- and shock-resistant fasteners for attachments to concrete slabs.

J. Tests: Test pull-out resistance of one of each type, size, and anchorage material for the following fastener types:

1. Expansion anchors.
2. Toggle bolts.

K. Provide all jacks, jigs, fixtures, and calibrated indicating scales required for reliable testing. Obtain the Contracting Officer's approval before transmitting loads to the structure. Test to 90 percent of rated proof load for fastener. If fastening fails test, revise all similar fastener installations and retest until satisfactory results are achieved.

3.2 TABLE I: SPACING FOR RACEWAY SUPPORTS

<table>
<thead>
<tr>
<th>Raceway Size, In.</th>
<th>Location</th>
<th>RMC &amp; IMC (1)</th>
<th>EMT (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/2-1</td>
<td>Any Location</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>1 &amp; Larger</td>
<td>Any Location</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

NOTES:
(1) Maximum spacing of supports (feet).
(2) Maximum spacings for IMC above apply to straight runs only. Otherwise the maximums for EMT apply.
<table>
<thead>
<tr>
<th>Abbreviations</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMT</td>
<td>Electrical metallic tubing.</td>
</tr>
<tr>
<td>IMC</td>
<td>Intermediate metallic conduit.</td>
</tr>
<tr>
<td>RMC</td>
<td>Rigid metallic conduit.</td>
</tr>
</tbody>
</table>

END OF SECTION 26 05 29
SECTION 26 05 33

RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

B. Raceways include the following:

1. Rigid metal conduit.
2. Intermediate metal conduit.
3. Polyvinyl chloride (PVC) externally coated rigid steel conduit.
4. PVC externally coated intermediate metal conduit.
5. Electrical metallic tubing (EMT).
6. Flexible metal conduit.
7. Liquidtight flexible conduit.
8. Rigid nonmetallic conduit.
9. Wireway.
10. Surface raceways.

C. Boxes, enclosures, and cabinets include the following:

1. Device boxes.
2. Floor boxes.
3. Outlet boxes.
4. Pull and junction boxes.
5. Cabinets and hinged cover enclosures.

D. Related Sections: The following Sections contain requirements that relate to this Section:

1. See Division 7, Section Firestopping.
2. See Division 26, Section 26 0529, Hangers and Supports for Electrical Systems.
3. See Division 26, Section 26 0534, Floor Boxes For Electrical Systems.
4. See Division 26, Section 26 0536, Cable Trays for Electrical Systems.
5. See Division 26, Section 26 0543, Underground Ducts and Raceways for Electrical Systems.
6. See Division 26, Section 26 2726, Wiring Devices.
1.3 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for surface raceway, wireway and fittings, floor boxes, hinged cover enclosures, and cabinets.

C. Shop drawings for nonstandard boxes, enclosures, and cabinets. Include layout drawings showing components and wiring.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 70, National Electrical Code, for components and installation.

B. Listing and Labeling: Provide products specified in this Section that are listed and labeled.

1. The Terms "Listed and Labeled": As defined in the National Electrical Code, Article 100.

C. Comply with NECA "Standard of Installation."

D. Coordinate layout and installation of raceway and boxes with other construction elements to ensure adequate headroom, working clearance, and access.

1.5 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. FMC: Flexible metal conduit.

C. IMC: Intermediate metal conduit.

D. LFMC: Liquidtight flexible metal conduit.

E. RNC: Rigid nonmetallic conduit.

F. MC: Metal Clad Cable. A factory assembly of one or more insulated conductors enclosed in an armor of interlocking metal tape, or a smooth corrugated metallic sheath.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide Products by one of the following:

1. Metal Conduit and Tubing:
   a. Monogram Co., AFC.
   b. Alflex Corp.
   c. Allied Tube and Conduit, Grinnell Co.
   d. Anamet, Inc., Anaconda Metal Hose.
   e. Anixter Brothers, Inc.
   f. Carol Cable Co., Inc.
   g. Cole-Flex Corp.
   h. Flexcon, Inc., Coleman Cable Systems, Inc.
   i. Spiraduct, Inc.
   j. Triangle PWC, Inc.
   k. Wheatland Tube Co.

2. Nonmetallic Conduit:
   b. Arnco Corp.
   c. Breeze-Illinois, Inc.
   d. Can-Tex Industries, Harsco Corp.
   e. Carlon.
   f. Certainteed Corp, Pipe & Plastics Group.
   g. Cole-Flex Corp.
   i. Electri-Flex Co.
   j. George-Ingraham Corp.
   k. Hubbell, Inc., Raco, Inc.
   l. R&G Sloan Manufacturing Co., Inc.
   m. Spiraduct, Inc.
   n. Thomas & Betts Corp.

3. Conduit Bodies and Fittings:
   a. Scott Fetzer Company, Adalet-PLM.
   d. Carlon
   f. General Signal, O-Z/Gedney Unit
   g. Spring City Electrical Manufacturing Co.
4. Wireway:
   c. Square D Co.

5. Surface Metal Raceway:
   a. Airey-Thompson Co., Inc., A-T Power Systems
   b. American Electric, Construction Materials Group
   c. Butler Manufacturing Co., Walker Division
   d. The Wiremold Co., Electrical Sales Division
   e. Mono Systems

6. Surface Nonmetallic Raceway:
   a. Anixter Brothers, Inc.
   b. Butler Manufacturing Co., Walker Division
   c. Hubbell, Inc., Wiring Device Division
   d. JBC Enterprises, Inc., Enduro Fiberglass Systems
   e. Panduit Corp.
   f. United Telecom, Premier Telecom Products, Inc.
   g. Thermo Tools Co.
   h. The Wiremold Co., Electrical Sales Division
   i. Mono Systems

7. Boxes, Enclosures, and Cabinets:
   a. Scott Fetzer Company, Adalet-PLM
   b. Butler Manufacturing Co., Walker Division
   c. Cooper Industries, Midwest Electric
   d. Electric Panelboard Co., Inc.
   e. Erickson Electrical Equipment Co.
   f. American Electric, FL Industries
   h. Hubbell Inc., Killark Electric Manufacturing Co.
   i. General Signal, O-Z/Gedney
   j. Parker Electrical Manufacturing Co.
   k. Raco, Inc., Hubbell Inc.
   l. Robroy Industries, Inc., Electrical Division
   m. Spring City Electrical Manufacturing Co.
   n. Square D Co.
   o. Thomas & Betts Corp.
2.2 METAL CONDUIT AND TUBING

A. Rigid Steel Conduit: ANSI C80.1.
B. Intermediate Metal Conduit: ANSI C80.6.
E. Electrical Metallic Tubing and Fittings: ANSI C80.3 with compression-type, steel fittings. Set-screw fittings are not permitted. Cast metal fittings are not permitted.
F. Flexible Metal Conduit: Aluminum or Zinc Coated Steel.
G. Liquidtight Flexible Metal Conduit: Flexible steel conduit with PVC jacket.
H. Fittings: NEMA FB 1, compatible with conduit/tubing materials.

2.3 NONMETALLIC CONDUIT

A. Rigid Nonmetallic Conduit (RNC): NEMA TC 2, Schedule 40 or 80 PVC.
B. PVC Conduit and Tubing Fittings: NEMA TC 3; match to conduit or conduit/tubing type and material.

2.4 WIREWAYS

A. Material: Sheet metal sized and shaped as indicated.
B. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireway as required for complete system.
C. Select features where not otherwise indicated, as required to complete wiring system and to comply with NEC.
D. Wireway Covers: Hinged type.
E. Finish: Manufacturer's standard enamel finish.

2.5 SURFACE RACEWAY

A. Types, sizes, and channels as indicated and required for each application, with fittings that match and mate with raceway.
B. Surface Metal Raceway: Galvanized steel with snap-on covers. Finish with manufacturer's standard prime coating suitable for painting.

C. Surface Nonmetallic Raceway: 2-piece construction, manufactured of rigid PVC compound with matte texture and manufacturer's standard color.

2.6 OUTLET AND DEVICE BOXES

A. Sheet Metal Boxes: NEMA OS 1.

B. Cast Metal Boxes: NEMA FB 1, type FD, cast ferroloy box with gasketed cover.

C. Nonmetallic Boxes: NEMA OS 2.

2.7 FLOOR BOXES

A. See Division 26, Section 26 0534, Floor Boxes For Electrical Systems

2.8 PULL AND JUNCTION BOXES

A. Small Sheet Metal Boxes: NEMA OS 1.

B. Cast Metal Boxes: NEMA FB 1, cast aluminum with gasketed cover.

2.9 CABINETS AND ENCLOSURES

A. Hinged Cover Enclosures: NEMA 250, steel enclosure with continuous hinge cover and flush latch. Finish inside and out with manufacturer's standard enamel.

B. Cabinets: NEMA 250, type 1, galvanized steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Hinged door in front cover with flush latch and concealed hinge. Key latch to match panelboards. Include metal barriers to separate wiring of different systems and voltage, and include accessory feet where required for freestanding equipment.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to receive raceways, boxes, enclosures, and cabinets for compliance with installation tolerances and other conditions affecting performance of the raceway system. Do not proceed with installation until unsatisfactory conditions have been corrected.
3.2 WIRING METHODS

A. Outdoors: Use the following wiring methods, 3/4” minimum trade size:

1. Exposed: Rigid or intermediate metal conduit.
2. Concealed: Rigid or intermediate metal conduit.
5. Connection to Vibrating Equipment (including transformers and hydraulic, pneumatic, or electric solenoid or motor-driven equipment): Liquidtight flexible metal conduit.
6. Boxes and Enclosures: NEMA Type 3R or Type 4.

B. Indoors: Use the following wiring methods, 3/4” minimum trade size except as noted below:

1. Connection to Vibrating Equipment and Light Fixtures: (including transformers and hydraulic, pneumatic, or electric solenoid or motor-driven equipment): Flexible metal conduit, except in wet or damp locations use Liquidtight flexible metal conduit, 1/2” trade size minimum.
2. Connection to Light Fixtures: 1/2” trade size minimum, flexible metal conduit, except in wet or damp locations use Liquidtight flexible metal conduit, or solid connection using material conforming to requirements for materials specified in this Paragraph B.
3. Damp or Wet Locations: Rigid steel conduit.
5. Locations Subject to Physical Damage: Rigid or intermediate steel conduit.
6. Corrosive Locations: Plastic coated rigid steel or rigid non-metallic conduit.
8. Boxes and Enclosures: NEMA Type 1, except in damp or wet locations use NEMA Type 4, stainless steel.
9. FMC / LFMC / MC: Use is restricted unless otherwise noted on drawings. FMC, LFMC, and MC are permitted in only the following locations:
   a. FMC/LFMC: All motor connections in lengths not less than 12 inches or more than 30 inches. All flexible conduit motor connections in damp locations shall have a liquid-tight covering. (Boiler rooms, mechanical equipment rooms and kitchens shall be considered as damp locations for this requirement).
   b. FMC/MC: 1) Concealed within special equipment cabinets.

3.3 INSTALLATION

A. Install raceways, boxes, enclosures, and cabinets as indicated, according to manufacturer's written instructions.

B. Conceal conduit and EMT, unless otherwise indicated, within finished walls, ceilings, and floors.

C. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot water pipes. Install horizontal raceway runs above water and steam piping.
D. Install raceways level and square and at proper elevations. Provide adequate headroom.

E. Complete raceway installation before starting conductor installation.

F. Support raceway as specified in Division 26, Section 26 0529, Hangers and Supports for Electrical Systems.

G. Use temporary closures to prevent foreign matter from entering raceway.

H. Protect stub-ups from damage where conduits rise through floor slabs. Arrange so curved portion of bends is not visible above the finished slab.

I. Make bends and offsets so the inside diameter is not reduced. Unless otherwise indicated, keep the legs of a bend in the same plane and the straight legs of offsets parallel.

J. Use raceway fittings compatible with raceway and suitable for use and location. For intermediate steel conduit, use threaded rigid steel conduit fittings, except as otherwise indicated.

K. Run concealed raceways with a minimum of bends in the shortest practical distance considering the type of building construction and obstructions, except as otherwise indicated.

L. Raceways Embedded in Slabs: NO CONDUITS SHALL BE PLACED WITHIN ANY CONCRETE SLABS EXCEPT AS SPECIFICALLY APPROVED BY THE ARCHITECT VIA FORMAL REQUEST.

M. Install exposed raceways parallel to or at right angles to nearby surfaces or structural members, and follow the surface contours as much as practical.

1. Run parallel or banked raceways together, on common supports where practical.
2. Make bends in parallel or banked runs from same center line to make bends parallel. Use factory elbows only where they can be installed parallel; otherwise, provide field bends for parallel raceways.

N. Join raceways with fittings designed and approved for the purpose and make joints tight.

1. Make raceway terminations tight. Use bonding bushings or wedges at connections subject to vibration. Use bonding jumpers where joints cannot be made tight.
2. Use insulating bushings to protect conductors.

O. Tighten set screws of threadless fittings with suitable tool.

P. Terminations: Where raceways are terminated with locknuts and bushings, align the raceway to enter squarely, and install the locknuts with dished part against the box. Where terminations cannot be made secure with one locknut, use two locknuts, one inside and one outside the box.

Q. Where terminating in threaded hubs, screw the raceway or fitting tight into the hub so the end bears against the wire protection shoulder. Where chase nipples are used, align the raceway so the coupling is square to the box, and tighten the chase nipple so no threads are exposed.
R. Install pull wires in empty raceways. Use No. 14 AWG zinc-coated steel or monofilament plastic line having not less than 200-lb tensile strength. Leave not less than 12 inches of slack at each end of the pull wire.

S. Telephone and Signal System Raceways 2-Inch Trade Size and Smaller: In addition to the above requirements, install in maximum lengths of 150 feet and with a maximum of two 90-deg bends or equivalent. Install pull or junction boxes where necessary to comply with these requirements.

T. Install raceway sealing fittings according to the manufacturer's written instructions. Locate fittings at suitble, approved, accessible locations and fill them with UL-listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points and elsewhere as indicated:

1. Where conduits enter or leave hazardous locations.
2. Where conduits pass from warm locations to cold locations, such as the boundaries of refrigerated spaces and air-conditioned spaces.
3. Where otherwise required by the NEC.

U. Stub-Up Connections: Extend conduits through concrete floor for connection to freestanding equipment with an adjustable top or coupling threaded inside for plugs, and set flush with the finished floor. Extend conductors to equipment with rigid steel conduit; flexible metal conduit may be used 6 inches above the floor. Install insulated grounding bushings on each conduit and bond to ground system. Where equipment connections are not made under this Contract, install screwdriver-operated threaded flush plugs flush with floor.

V. Flexible Connections: Use maximum of 6 feet of flexible conduit for recessed and semi-recessed lighting fixtures; for equipment subject to vibration, noise transmission, or movement; and for all motors. Use Liquidtight flexible conduit in wet or damp locations. Install separate ground conductor across flexible connections.

W. Do not install aluminum conduit embedded in or in contact with concrete.

X. PVC Externally Coated Rigid Steel Conduit: Use only fittings approved for use with that material. Patch all nicks and scrapes in PVC coating after installing conduit.

Y. Underground 90 degree elbows 2-inch trade size or larger, use plastic coated or tape wrapped intermediate metal or rigid steel conduit. Comply with NEC for grounding.

Z. Surface Metal Raceway: Install a separate green ground conductor in raceway from the junction box supplying the raceway to receptacle or fixture ground terminals.

1. Select each surface metal raceway outlet box to which a lighting fixture is attached to be of sufficient diameter to provide a seat for the fixture canopy.
2. Where a surface metal raceway is used to supply a fluorescent lighting fixture having central stem suspension with a backplate and a canopy (with or without extension ring), the backplate and canopy will serve as the outlet box and no separate outlet box need be provided.
3. Provide surface metal raceway outlet box, in addition to the backplate and canopy, at the feed-in location of each fluorescent lighting fixture having end stem suspension.
4. Where a surface metal raceway extension is made from an existing outlet box on which a lighting fixture is installed (provide a backplate slightly smaller than the fixture canopy), no additional surface mounted outlet box need be installed.

AA. Set floor boxes level and adjust to floor surface.
BB. Install hinged cover enclosures and cabinets plumb. Support at each corner.

CC. Provide grounding connections for raceway, boxes, and components as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals according to tightening torques specified in UL Standard 486A.

DD. On all service, feeder, and branch circuit conduits, 2-inches and large, install grounding-type insulated bushings on each conduit entering all boxes, enclosures, and equipment. Bond conduit grounding bushing to a grounding bus in box, enclosure, or equipment with conductor sized per NEC 250-95. Do not use grounding conductor to bond bushing to grounding bus.

EE. All exposed conduit, fittings, boxes, hangers, clips, supports, etc., in finished areas to be painted per the Architect's/Engineer's instructions.

FF. Raceways and boxes under roof decking: Comply with NEC 300.4(E) for installation below roof decking.

3.4 PROTECTION
A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, to ensure that coatings, finishes, and cabinets are without damage or deterioration at Substantial Completion.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC or paint finishes with matching touch-up coating recommended by the manufacturer.

3.5 CLEANING
A. Upon completion of installation of system, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.

END OF SECTION 26 05 33
SECTION 26 05 44

SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS & CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
   2. Sleeve-seal systems.
   5. Silicone sealants.

B. Related Requirements:
   1. Section 07 84 13 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. LEED Submittals:
   1. Product Data for Credit EQ 4.1: For sealants, documentation including printed statement of VOC content.
   2. Laboratory Test Reports for Credit EQ 4: For sealants, documentation indicating that products comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
PART 2 - PRODUCTS

2.1 SLEEVES

A. Wall Sleeves:
   2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

D. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

E. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

F. Sleeves for Rectangular Openings:
   2. Minimum Metal Thickness:
      a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.
      b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Advance Products & Systems, Inc.
   b. CALPICO, Inc.
   c. Metraflex Company (The).
   d. Pipeline Seal and Insulator, Inc.
   e. Proco Products, Inc.
2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Carbon steel.
4. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Presealed Systems.

2.4 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.


C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.
2. Sealant shall have VOC content of 35 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
   a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."
   b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.

4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.

5. Install sleeves for floor penetrations. Extend sleeves installed in floors 4 inches above finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.

2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.
3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 26 05 44
SECTION 26 05 48

VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Isolation pads.
2. Spring isolators.
3. Restrained spring isolators.
4. Channel support systems.
5. Restraint cables.
6. Hanger rod stiffeners.
7. Anchorage bushings and washers.

B. Related Sections include the following:

1. Division 26 Section "Supporting Devices" for commonly used electrical supports and installation requirements.

1.3 DEFINITIONS


C. OSHPD: Office of Statewide Health Planning and Development for the State of California.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic-Restraint Loading:

1. For site soil classification, refer to Owner’s geotechnical report
2. Seismic Design Category and Assigned Seismic Use Group or Building Category: Refer to Architectural drawings and specifications.
3. Component Importance Factor: 1.5.
4. Acceleration Parameters:
   a. SMS = 0.645.
   b. SM1 = 0.273.
   c. SDS = 0.430.
   d. SD1 = 0.182.

5. Design Spectral Response Acceleration at Short Periods (0.2 Second): 0.546.

1.5 SCOPE

A. Furnish and install vibration isolation and seismic restraints, complete as indicated, specified and required by code. The Contractor is responsible for obtaining the services of a structural engineer who is qualified to perform the services herein.

B. Seismically restrain all systems and equipment. Importance factor shall be 1.0 for all components and systems except components in the following systems shall have an importance factor of 1.5, and must remain in service after a seismic event:
## 1.6 SUBMITTALS

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As required to support the other areas of the Hospital

#### A. Product Data: For the following:

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.
   a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an agency acceptable to authorities having jurisdiction.
   b. Annotate to indicate application of each product submitted and compliance with requirements.


B. Delegated-Design Submittal: For vibration isolation and seismic-restraint details indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Design Calculations: Calculate static and dynamic loading due to equipment weight and operation, seismic forces required to select vibration isolators and seismic restraints.
   a. Coordinate design calculations with wind-load calculations required for equipment mounted outdoors. Comply with requirements in other Division 27 Sections for equipment mounted outdoors.

2. Indicate materials and dimensions and identify hardware, including attachment and anchorage devices.
3. Field-fabricated supports.
4. Seismic-Restraint Details:
   a. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.
   b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
   c. Preapproval and Evaluation Documentation: By an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

C. Coordination Drawings: Show coordination of seismic bracing for electrical components with other systems and equipment in the vicinity, including other supports and seismic restraints.

D. Welding certificates.

E. Qualification Data: For professional engineer and testing agency.

F. Field quality-control test reports.
1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

B. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.

C. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

E. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 VIBRATION ISOLATORS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Ace Mountings Co., Inc.
2. Amber/Booth Company, Inc.
4. Isolation Technology, Inc.
7. Vibration Eliminator Co., Inc.
8. Vibration Isolation.

B. Pads: Arrange in single or multiple layers of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized-steel baseplates, and factory cut to sizes that match requirements of supported equipment.

1. Resilient Material: Oil- and water-resistant neoprene.
2.2 SEISMIC-RESTRAINT DEVICES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Amber/Booth Company, Inc.
2. California Dynamics Corporation.
3. Cooper B-Line, Inc.; a division of Cooper Industries.
4. Hilti Inc.
5. Loos & Co.; Seismic Earthquake Division.
7. TOLCO Incorporated; a brand of NIBCO INC.
8. Unistrut; Tyco International, Ltd.

B. General Requirements for Restraint Components: Rated strengths, features, and application requirements shall be as defined in reports by an agency acceptable to authorities having jurisdiction.

1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.

C. Channel Support System: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.

D. Restraint Cables: ASTM A 603 galvanized-steel cables with end connections made of steel assemblies with thimbles, brackets, swivels, and bolts designed for restraining cable service; and with a minimum of two clamping bolts for cable engagement.

E. Hanger Rod Stiffener: Reinforcing steel angle clamped to hanger rod. Do not weld stiffeners to rods.

F. Bushings for Floor-Mounted Equipment Anchor: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchors and studs.

G. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices.

H. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

I. Mechanical Anchor: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchors with strength required for anchor and as tested according to ASTM E 488. Minimum length of eight times diameter.
J. Adhesive Anchor: Drilled-in and capsule anchor system containing polyvinyl or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

2.3 FACTORY FINISHES

A. Finish: Manufacturer's standard prime-coat finish ready for field painting.

B. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.

   1. Powder coating on springs and housings.
   2. All hardware shall be galvanized. Hot-dip galvanize metal components for exterior use.
   3. Baked enamel or powder coat for metal components on isolators for interior use.
   4. Color-code or otherwise mark vibration isolation and seismic-control devices to indicate capacity range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Multiple Raceways or Cables: Secure raceways and cables to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.

B. Hanger Rod Stiffeners: Install hanger rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.
3.3 SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Equipment and Hanger Restraints:
   1. Install restrained isolators on electrical equipment.
   2. Install resilient, bolt-isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
   3. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.

B. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall. This is required only where applicable such as patient rooms.

C. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

D. Drilled-in Anchors:
   1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
   2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
   3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
   4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
   5. Set anchors to manufacturer's recommended torque, using a torque wrench.
   6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.4 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where they terminate with connection to equipment that is anchored to a different structural element from the one supporting them as they approach equipment. Cable tray may have 2”-3” gap at seismic joint with ground bonding jumper.
3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and prepare test reports.

B. Perform tests and inspections.

C. Tests and Inspections:
   1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
   2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.
   4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
   5. Test to 90 percent of rated proof load of device.
   7. Measure isolator deflection.
   8. Verify snubber minimum clearances.
   9. If a device fails test, modify all installations of same type and retest until satisfactory results are achieved.

D. Remove and replace malfunctioning units and retest as specified above.

E. Prepare test and inspection reports.

3.6 ADJUSTING

A. Adjust isolators after isolated equipment is at operating weight.

B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

C. Adjust active height of spring isolators.

D. Adjust restraints to permit free movement of equipment within normal mode of operation.

END OF SECTION 26 05 48
SECTION 26 05 50

INSTALLATION COORDINATION

PART 1 - GENERAL

1.1 REQUIREMENTS

A. See Division 21, Section 21 05 49, Fire Protection & Electrical Installation Coordination.

B. See Division 22, Section 22 05 49, Plumbing & Electrical Installation Coordination.

C. See Division 23, Section 23 05 49, HVAC & Electrical Installation Coordination

D. See Mechanical Drawings for control requirements and for items requiring 120V (or greater) power.

E. See Division 27, Section 27 05 50, Installation Coordination for Communications Systems.

F. See Division 28, Section 28 05 50, Installation Coordination for Electronic Safety and Security.

G. See Technology / Special Systems Drawings for items requiring 120V (or greater) power.

PART 2 - PRODUCTS

Not applicable.

PART 3 - EXECUTION

Not applicable.

END OF SECTION 26 05 50
SECTION 26 05 53
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

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

1.2 SUMMARY
   A. This Section includes identification of electrical materials, equipment, and installations.

1.3 SUBMITTALS
   A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
   B. Product Data for each type of product specified.
   C. Schedule of identification nomenclature to be used for identification signs and labels.
   D. Samples for each color, lettering style, and other graphic representation required for identification materials; samples of labels and signs.
   E. Details of EIA/TIA 606 compliance for labeling.

1.4 QUALITY ASSURANCE
   A. Comply with NFPA 70.
   B. Comply with EIA/TIA 606 for telephone, data, and fiber optic systems.

1.5 SEQUENCING AND SCHEDULING
   A. Coordinate installing electrical identification after completion of finishing where identification is applied to field-finished surfaces.
   B. Coordinate installing electrical identifying devices and markings prior to installing acoustical ceilings and similar finishes that conceal such items.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Labelmark Co.; Labelmaster Subsidiary
2. Brady USA, Inc.; Industrial Products Div.
3. Calpico, Inc.
5. Champion American, Inc.
6. Cole-Flex Corp.
7. D&G Sign and Label
8. EMED Co., Inc.
9. George-Ingraham Corp. (The)
10. Grimco, Inc.
11. Ideal Industries, Inc.
12. Kraftbilt
13. LEM Products, Inc.
14. Markal Corp.
15. National Band & Tag Co.
16. Panduit Corp.
17. Radar Engineers
19. Seton Name Plate Co.

2.2 RACEWAY AND CABLE LABELS

A. Manufacturer's Standard Products: Where more than one type is listed for a specified application, selection is Installer's option, but provide single type for each application category. Use colors prescribed by ANSI A13.1, NFPA 70, and these Specifications.

B. Conform to ANSI A13.1, Table 3, for minimum size of letters for legend and minimum length of color field for each raceway or cable size.

1. Color: Black legend on orange field.
2. Legend: Indicates voltage and service.

C. Adhesive Labels: Preprinted, flexible, self-adhesive vinyl. Legend is over-laminated with a clear, weather- and chemical-resistant coating.

D. Pre-tensioned, Wraparound Plastic Sleeves: Flexible, preprinted, color-coded, acrylic bands sized to suit the diameter of the line it identifies and arranged to stay in place by pre-tensioned gripping action when placed in position.
E. Colored Adhesive Tape: Self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

F. Underground Line Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape with the following features:
   1. Size: Not less than 6 inches wide by 4 mils thick.
   2. Compounded for permanent direct-burial service.
   3. Embedded continuous metallic strip or core.
   4. Printed Legend: Indicates type of underground line.

G. Tape Markers: Vinyl or vinyl-cloth, self-adhesive, wraparound type with preprinted numbers and letters.

H. Aluminum, Wraparound Marker Bands: Bands cut from 0.014-inch thick aluminum sheet, with stamped or embossed legend, and fitted with slots or ears for permanently securing around wire or cable jacket or around groups of conductors.

I. Plasticized Card-Stock Tags: Vinyl cloth with preprinted and field-printed legends. Orange background, except as otherwise indicated, with eyelet for fastener.

J. Aluminum-Faced Card-Stock Tags: Weather-resistant, 18-point minimum card stock faced on both sides with embossable aluminum sheet, 0.002 inch thick, laminated with moisture-resistant acrylic adhesive, and punched for the fastener. Preprinted legends suit each application.

K. Brass or Aluminum Tags: Metal tags with stamped legend, punched for fastener. Dimensions: 2 by 2 inches by 0.05 inch.

2.3 ENGRAVED NAMEPLATES AND SIGNS

A. Manufacturer's Standard Products: Where more than one type is listed for a specified application, selection is Installer's option, but provide single type for each application category. Use colors prescribed by ANSI A13.1, NFPA 70, and these Specifications.

B. Engraving stock, melamine plastic laminate, 1/16-inch minimum thick for signs up to 20 sq. in., 1/8 inch thick for larger sizes.
   1. Engraved Legend:
      a. Normal Power – White letters on black face, unless noted otherwise on drawings.
      b. Emergency Power – White letters on red face, unless noted otherwise on drawings.
      c. UPS Power – White letters on blue face, unless noted otherwise on drawings.
   2. Punched for mechanical fasteners.

C. Baked-Enamel Signs for Interior Use: Preprinted aluminum signs, punched for fasteners, with colors, legend, and size as indicated or as otherwise required for the application. 1/4-inch grommets in corners for mounting.
D. Exterior, Metal-Backed, Butyrate Signs: Weather-resistant, non-fading, preprinted, cellulose acetate butyrate signs with 0.0396-inch, galvanized steel backing, with colors, legend, and size appropriate to the application. 1/4-inch grommets in corners for mounting.

E. Fasteners for Plastic-Laminated and Metal Signs: Self-tapping stainless-steel screws or No. 10/32 stainless-steel machine screws with nuts and flat and lock washers.

2.4 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Cable Ties: Fungus-inert, self-extinguishing, 1-piece, self-locking, Type 6/6 nylon cable ties with the following features:

2. Tensile Strength: 50 lb minimum.
3. Temperature Range: Minus 40 to 185 deg F (Minus 4 to 85 deg C).
4. Color: As indicated where used for color coding.

B. Paint: Alkyd-urethane enamel over primer as recommended by enamel manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install identification devices according to manufacturer's written instructions.

B. Install labels where indicated and at locations for best convenience of viewing without interference with operation and maintenance of equipment.

C. Lettering, Colors, and Graphics: Coordinate names, abbreviations, colors, and other designations used for electrical identification with corresponding designations used in the Contract Documents or required by codes and standards. Use consistent designations throughout the Project.

D. Sequence of Work: Where identification is to be applied to surfaces that require finish, install identification after completion of finish work.

E. Self-Adhesive Identification Products: Clean surfaces of dust, loose material, and oily films before applying.

F. Install painted identification as follows:

1. Clean surfaces of dust, loose material, and oily films before painting.
2. Prime Surfaces: For galvanized metal, use single-component, acrylic vehicle coating formulated for galvanized surfaces. For concrete masonry units, use heavy-duty, acrylic-resin block filler. For concrete surfaces, use clear, alkali-resistant, alkyd binder-type sealer.
3. Apply one intermediate and one finish coat of silicone alkyd enamel.
4. Apply primer and finish materials according to manufacturer's instructions.

G. Identify Raceways and Exposed Cables with Color Banding: Band exposed and accessible raceways of the systems listed below for identification.
   1. Bands: Pre-tensioned, snap-around, colored plastic sleeves; colored adhesive tape; or a combination of both. Make each color band 2 inches wide, completely encircling conduit, and place adjacent bands of 2-color markings in contact, side by side.
   2. Locate bands at changes in direction, at penetrations of walls and floors, at 20-foot maximum intervals in straight runs, and at 10 feet in congested areas.
   3. Colors: As follows:
      a. 120/208 Volt – Black.
      b. 277/480 Volt – Blue.
      c. Emergency 120/208 Volt – Black and orange.
      d. Emergency 277/480 Volt – Blue and orange.
      e. Fire-Alarm System: Red.
      h. Security System: Blue and yellow.
      i. Mechanical and Electrical Supervisory System: Green and blue.
      j. Telecommunications System: Green and yellow.

H. Install Caution Signs for Enclosures Over 600 V: Use pressure-sensitive, self-adhesive label indicating system voltage in black, preprinted on orange field. Install on exterior of door or cover.

I. Install Circuit Identification Labels on Boxes: Label externally as follows:
   1. Exposed Boxes: Pressure-sensitive, self-adhesive plastic label on cover.
   3. Labeling Legend: Permanent, waterproof listing of panel and circuit number or equivalent.

J. Identify Paths of Underground Electrical Lines: During trench backfilling, for exterior underground power, control, signal, and communications lines, install continuous underground plastic line marker located directly above line at 6 to 8 inches below finished grade. Where multiple lines installed in a common trench or concrete envelope do not exceed an overall width of 16 inches, use a single line marker.
   1. Install line marker for underground wiring, both direct buried and in raceway.

K. Color-Code Conductors: Secondary service, feeder, and branch circuit conductors throughout the secondary electrical system.
   1. 208/120-V System: As follows:
      a. Phase A: Black.
      b. Phase B: Red.
c. Phase C: Blue.
e. Ground: Green.

2. 480/277-V System: As follows:
   b. Phase B: Orange.
   c. Phase C: Yellow.
   d. Neutral: Grey.
   e. Ground: Green.

3. Factory-apply color the entire length of the conductors, except the following field-applied, color-coding methods may be used in lieu of factory-coded wire for phase conductor's sizes larger than No. 10 AWG and grounded conductors and grounding conductors larger than No. 6 AWG.
   a. Colored, pressure-sensitive plastic tape in half-lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply the last 2 turns of tape with no tension to prevent possible unwinding. Use 1-inch wide tape in colors as specified. Adjust tape bands to avoid obscuring cable identification markings.
   b. Colored cable ties applied in groups of 3 ties of specified color to each wire at each terminal or splice point starting 3 inches from the terminal and spaced 3 inches apart. Apply with a special tool or pliers, tighten to a snug fit, and cut off excess length.

L. Power Circuit Identification: Use metal tags or aluminum wraparound marker bands for cables, feeders, and power circuits in vaults, pull boxes, junction boxes, manholes, and switchboard rooms.
   1. Legend: 1/4-inch steel letter and number stamping or embossing with legend corresponding to indicated circuit designations.
   2. Fasten tags with nylon cable ties; fasten bands using integral ears.

M. Apply identification to conductors as follows:
   2. Multiple Power or Lighting Circuits in the Same Enclosure: Identify each conductor with source, voltage, circuit number, and phase. Use color coding for voltage and phase indication of secondary circuit.
   3. Multiple Control and Communications Circuits in the Same Enclosure: Identify each conductor by its system and circuit designation. Use a consistent system of tags, color coding, or cable marking tape.
N. Apply warning, caution, and instruction signs and stencils as follows:

1. Install warning, caution, and instruction signs where indicated or required to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved, plastic-laminated instruction signs with approved legend where instructions or explanations are needed for system or equipment operation. Install butyrate signs with metal backing for outdoor items.

2. Emergency-Operating Signs: Install engraved laminate signs with white legend on red background with minimum 3/8-inch high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.

O. Install identification as follows:

1. Apply equipment identification labels of engraved plastic laminate on each major unit of equipment, including central or master unit of each system. This includes communication, signal, and alarm systems, unless units are specified with their own self-explanatory identification. Except as otherwise indicated, provide a single line of text with 1/2-inch high lettering on 1-1/2-inch high label; where 2 lines of text are required, use lettering 2 inches high. Use white lettering on black field. Apply labels for each unit of the following categories of equipment.

P. Example: Panel 1H1 120/208V, 3-PH, 4-wire fed from panel MDR-CCT#4.

a. Panelboards, electrical cabinets, and enclosures.
b. Access doors and panels for concealed electrical items.
c. Electrical switchgear and switchboards.
d. Electrical substations.
e. Motor control centers.
f. Motor starters.
g. Push-button stations.
h. Power transfer equipment.
i. Contactors.
j. Remote-controlled switches.
k. Dimmers.
l. Control devices.
m. Switches and receptacles.
n. Transformers.
o. Inverters.
p. Rectifiers.
q. Frequency converters.
r. Battery racks.
s. Power-generating units.
t. Telephone switching equipment.
u. Clock/program master equipment.
v. Call system master station.
w. TV/audio monitoring master station.
x. Fire-alarm master station or control panel.
y. Security-monitoring master station or control panel.
2. Circuits: Apply identification labels of engraved metallic dyno on each switch and receptacle indicating panelboard and circuit number supplying receptacle.

3. Apply designation labels of engraved plastic laminate for disconnect switches, breakers, push buttons, pilot lights, motor control centers, and similar items for power distribution and control components above, except panelboards and alarm/signal components where labeling is specified elsewhere. For panelboards, provide framed, typed circuit schedules with explicit description and identification of items controlled by each individual breaker.

END OF SECTION 26 05 53
SECTION 26 08 00

ELECTRICAL FACILITY STARTUP/COMMISSIONING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Scope Of The Work

1. The purpose of this section is to specify Division 26 responsibilities and participation in the commissioning process. The owner will hire the Commissioning Authority for the project.
2. The Contractor is responsible to provide support to the Commissioning Authority as required for start-up, testing, and commissioning. The commissioning process requires significant participation of Division 26 to ensure all portions of the work have been completed in a satisfactory and fully operational manner.
3. The Contractor is responsible to provide complete “turn key” start-up, testing, and commissioning for the lighting control systems. Refer to drawings and Division 26 specification sections pertaining to lighting controls for complete scope.

B. Minimum requirements for Contractor:

1. Start-up and testing of the equipment supplied.
2. Operate and maintain equipment and systems as required for commissioning tests.
3. Providing qualified personnel including equipment manufacturer's service technicians for participation with the commissioning team.
4. Provide equipment, materials, and labor necessary to correct deficiencies found during the commissioning process, which fulfill contract and warranty requirements.
5. Provide operation and maintenance information and record drawings for verification, organization, and distribution.
6. Provide assistance to the Commissioning Authority (CA) to develop and edit equipment startup and testing schedules (Commissioning Matrix).
7. Provide training for the systems specified in this division with coordination by the Contract Administrator and Commissioning Authority.
8. Attend commissioning meetings.

1.2 RELATED WORK

A. All start-up and testing procedures and documentation requirements specified within Division 26.

B. Allow sufficient time before final commissioning dates so that testing, adjusting and demonstration can be accomplished.
C. Put all electrical gear into full operation only after all testing has been completed, and the Commissioning Authority has received the testing documentation.

D. Provide labor and material to make corrections when required.

1.3 DEFINITIONS

A. Point Verification Forms (PVF) are detailed installation and startup tracking documents developed by the Commissioning Authority and completed through a cooperative effort between the Contractor and the Commissioning Authority. The PVF’s will track each point through installation, termination, and connection to the Facility Management System (FMS).

B. Functional Performance Tests (FPT) are detailed testing procedures developed by the Commissioning Authority, and conducted through a cooperative effort between the Contractor and the Commissioning Authority. The FPT’s will be detailed step by step procedures developed for each electrical system. The majority of electrical testing will be by the third party electrical testing firm. Commissioning Authority generated FPT’s will be for systems such as lighting controls, dimmer controls, etc. Each FPT will have a clear acceptance criteria based in the contract documents which must be achieved before the system or sub-system is accepted by the Commissioning Authority and the Owner.

C. The Commissioning Authority (CA) is a firm hired directly by the Owner to oversee the entire commissioning process.

PART 2 - PRODUCTS

Not Applicable.

PART 3 - EXECUTION

3.1 WORK PRIOR TO COMMISSIONING

A. Complete all phases of work so the system can be tested, adjusted, and energized. Division 26 has primary start-up responsibilities with obligations to complete systems, including all sub-systems so they are fully functional and ready for testing and startup. This includes the complete installation of all equipment, materials, conduit, wire, supports, controls, etc., per the contract documents and related directives, clarifications, change orders, etc.

B. A commissioning plan will be developed by the CA and approved by the commissioning team. Division 26 is obligated to assist the CA in preparing the commissioning plan by providing all necessary information pertaining to the actual equipment and installation. If system modifications/clarifications are in the contractual requirements of this and related sections of work, they will be made at no additional cost to the Owner. If Contractor initiated system changes have been made that alter the commissioning process, notify the Commissioning Authority and Contract Administrator for approval.
C. Specific pre-commissioning responsibilities of Division 26 are as follows:

1. Bring each system to a fully construction completed state.
2. Commissioning is intended to begin upon completion of a system. To support Partial Occupancy commissioning may proceed prior to the completion of systems, or sub-systems, and will be coordinated with the CA as equipment Early Run. Start of commissioning before system completion will not relieve Division 26 from completing those systems as per the schedule.

3.2 PARTICIPATION IN COMMISSIONING

A. Provide skilled technicians to start up all systems within Division 26. These same technicians shall be made available to assist the CA in completing the commissioning program as it relates to each system and their technical specialty. Work schedules, time required for testing, etc., will be requested, coordinated by the CA, and tracked on the Commissioning Matrix. Division 26 will ensure that the qualified technician(s) are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustment, and/or problem resolutions.

B. System problems and discrepancies may require additional technician time or reconstruction of systems and system components. The additional technician time shall be made available for the subsequent commissioning periods until the required system performance is obtained.

C. The Contract Administrator and CA reserve the right to judge the appropriateness and qualifications of the technicians relative to each item of equipment or system. Qualifications of technicians include expert knowledge relative to the specific equipment involved, adequate documentation and tools to service/commission the equipment, and an attitude/willingness to work with the commissioning team to complete the job.

3.3 WORK TO RESOLVE DEFICIENCIES

A. In some systems, misadjustment, misapplied equipment and/or deficient performance under varying loads will result in additional work being required to commission the systems. This work will be completed under the direction of the Contract Administrator, with input from the Contractor, equipment supplier, and CA. Whereas all members will have input and the opportunity to discuss the work and resolve problems, the Contract Administrator will have final jurisdiction on the necessary work to be done to achieve performance.

B. Corrective work shall be completed in a timely fashion to permit completion of the commissioning process according to the schedule. Experimentation to render system performance will be permitted. If the CA deems the experimentation work to be ineffective or untimely as it relates to the commissioning process, the CA will notify the Owner indicating the nature of the problem, expected steps to be taken, and the deadline for completion of activities. If deadlines pass without resolution of the problem, the Owner reserves the right to obtain supplementary services and/or equipment to resolve the problem. Costs incurred to solve the problems in an expeditious manner will be the Contractor's responsibility.
3.4 TRAINING
A. Participate in the training of the Owner's engineering and maintenance staff, as required in Divisions 26, on each system and related components. Training, in part, will be conducted in a classroom setting, with system and component documentation, and suitable classroom training aids.

B. Training will be conducted by the Contractor and the equipment vendors.

C. Training for the Commissioning Team members on the Commissioning Plan will be provided by the CA. All Commissioning Team members are required to attend this training.

3.5 SYSTEMS DOCUMENTATION
A. In addition to the requirements of Division 26, update contract documents to incorporate field changes and revisions to system designs to account for actual constructed configurations. Red-line all drawings on two sets. Include architectural floor plans, elevations and details, and the individual electrical systems in relation to actual building layout in Division 26 as-built drawings.

B. Maintain as-built red-lines as required by Division 1. Given the size and complexity of this project, red-line drawings at completion of construction, based on memory of key personnel, is not satisfactory. Continuous and regular red-lining of drawings is considered essential and mandatory. Maintain these drawings in the construction trailer and make them available for inspection at any time.

3.6 MISCELLANEOUS SUPPORT
A. Division 26 shall remove and replace covers of equipment, open access panels, etc., to permit Contractor, Contract Administrator, or CA to observe equipment and controllers provided.

END OF SECTION 26 08 00
SECTION 26 08 80

ELECTRICAL ACCEPTANCE TESTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Refer to individual specification sections indicated below for tests to be performed and other requirements.

1.2 QUALITY ASSURANCE

A. Engage and pay for the services of a recognized independent Electrical Testing Agency for the purpose of performing the independent inspections, tests, adjustments and settings as specified herein and in other sections.

B. The Electrical Testing Agency shall provide all material, equipment, labor, and technical supervision to perform such tests and inspections.

C. The Electrical Testing Agency shall submit appropriate documentation to demonstrate that it satisfactorily complies with the following. An organization having a “Full Membership” classification issued by the InterNational Electrical Testing Association.

1. The Electrical Testing Agency shall be an independent, third party, testing organization which can function as an unbiased testing authority, professionally independent of the manufacturers, suppliers, and installers of equipment or systems evaluated by the testing organization.

2. The Electrical Testing Agency shall be regularly engaged in the testing of electrical equipment devices, installations, and systems.

D. The Electrical Testing Agency shall utilize technicians who are regularly employed for testing services.

E. Technicians performing these electrical tests and inspections shall be trained and experienced concerning the apparatus and systems being evaluated. These individuals shall be capable of conducting the tests in a safe manner and with complete knowledge of the hazards involved. They must evaluate the test data and make an informed judgment on the continued serviceability or nonserviceability of the specific equipment. Technicians shall be certified in
accordance with ANSI/NETA ETT–2000, Standard for Certification of Electrical Testing Technicians. Each on-site crew leader shall hold a current certification, Level III or higher, in electrical testing.

1.3 PERFORMANCE CRITERIA

A. Perform acceptance testing, inspection, and calibration to assure that installed electrical systems and equipment, either Owner or Subcontractor supplied are:

1. Installed in accordance with design Specifications and manufacturer’s instructions,
2. Ready to be energized,
3. Operational and within industry and manufacturer’s tolerances.

B. The following is a list of equipment and systems to be inspected, tested and calibrated by the Electrical Testing Agency. Refer to these specification sections for tests required.

<table>
<thead>
<tr>
<th>Section Number</th>
<th>Section Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>26 2413</td>
<td>SWITCHBOARDS</td>
</tr>
</tbody>
</table>

1.4 REGULATORY REQUIREMENTS

A. Make Inspections and tests in accordance with the applicable codes and standards of the following agencies except as provided otherwise herein:

2. ANSI/NETA ETT – 2000, Standard for the Certification of Electrical Testing Technicians
   b. ANSI/NFP A 70B: Recommended Practice for Electrical Equipment Maintenance.
   c. NFPA 70E: Electrical Safety Requirements for Employee Workplaces.

B. Use the following references:

1. Project design Specifications.
2. Project OVERCURRENT PROTECTIVE DEVICE STUDY – refer to Section 26 0573.
3. Manufacturer’s instruction manuals applicable to each particular apparatus.
4. Project list of equipment to be inspected and tested.
1.5 GENERAL REQUIREMENTS

A. Safety and Precautions

1. Safety practices shall include, but are not limited to, the following requirements:
   a. Occupational Safety and Health Act.
   c. Applicable state and local safety operating procedures.
   d. Owner’s safety practices.
   e. ANSI/NFPA 70E, Electrical Safety Requirements for Employee Workplaces.

2. All tests shall be performed with apparatus de-energized except where otherwise specifically required.

3. The Electrical Testing Agency shall have a designated safety representative on the project to supervise operations with respect to safety.

B. Suitability of Test Equipment

1. All test equipment shall be in good mechanical and electrical condition.

2. Split-core current transformers and clamp-on or tong-type ammeters require consideration of the following in regard to accuracy:
   a. Position of the conductor within the core
   b. Clean, tight fit of the core pole faces
   c. Presence of external magnetic fields
   d. Accuracy of the current transformer ratio in addition to the accuracy of the secondary meter.

3. Selection of metering equipment shall be based on a knowledge of the waveform of the variable being measured. Digital multimeters may be average or RMS sensing and may include or exclude the dc component. When the variable contains harmonics or dc offset and, in general, any deviation from a pure sine wave, average sensing, RMS scaled meters may be misleading.

4. Field test metering used to check power system meter calibration must have accuracy higher than that of the instrument being checked.

5. Accuracy of metering in test equipment shall be appropriate for the test being performed but not in excess of two percent of the scale used.

6. Waveshape and frequency of test equipment output waveforms shall be appropriate for the test and tested equipment.

C. Test Instrument Calibration

1. The Electrical Testing Agency shall have a calibration program which assures that all applicable test instruments are maintained within rated accuracy.

2. The accuracy shall be directly traceable to the National Institute of Standards and Technology (NIST).
3. Instruments shall be calibrated in accordance with the following frequency schedule:
   a. Field instruments: Analog, 6 months maximum; Digital, 12 months maximum
   b. Laboratory instruments: 12 months
   c. Leased specialty equipment: 12 months where accuracy is guaranteed by lessor.

4. Dated calibration labels shall be visible on all test equipment.
5. Records, which show date and results of instruments calibrated or tested, shall be kept up-to-date.
6. Up-to-date instrument calibration instructions and procedures shall be maintained for each test instrument.
7. Calibrating standard shall be of higher accuracy than that of the instrument tested.

D. Test Report

1. The test report shall include the following:
   a. Summary of project.
   b. Description of equipment tested.
   c. Description of test.
   d. Test data.
   e. Analysis and recommendations.

2. Test data records shall include the following minimum requirements:
   a. Identification of the testing organization.
   b. Equipment identification.
   c. Humidity, temperature, and other atmospheric conditions that may affect the results of the tests/calibrations.
   d. Date of inspections, tests, maintenance, and/or calibrations.
   e. Identification of the testing technician.
   f. Indication of inspections, tests, maintenance, and/or calibrations to be performed and recorded.
   g. Indication of expected results when calibrations are to be performed.
   h. Indication of “as-found” and “as-left” results.
   i. Sufficient spaces to allow all results and comments to be indicated.

3. The Electrical Testing Agency shall furnish a copy or copies of the complete report to the owner and Commissioning Authority as required in the acceptance contract.

1.6 SUBMITTALS

A. Qualifications of the Electrical Testing Agency shall be submitted to the COMMISSIONING AUTHORITY for review with the electrical equipment submittals in accordance with Section 26 05 00, "COMMON WORK RESULTS FOR ELECTRICAL, Submittals."
PART 2 - PRODUCTS

Not Used.

PART 3 - EXECUTION

3.1 GENERAL

A. Set all adjustable circuit breaker trip settings in accordance with the trip setting report from the ELECTRICAL SYSTEM PROTECTIVE DEVICE STUDY.

B. Test, inspect and calibrate the following electrical equipment in strict accordance with applicable sections of NETA ATS-2003.

1. Electrical equipment shown on the electrical Drawings.
2. Electrical equipment specified in all Division 26 Specifications for the Site.
3. Electrical equipment furnished under other Divisions of the Specifications and connected under Division 26.

C. Perform acceptance tests and inspections prior to energizing equipment, unless where energization is required to perform specified tests.

D. Final acceptance will not occur before completion of the electrical acceptance tests, inspections and calibrations specified in this Section.

3.2 FIELD QUALITY CONTROL

A. Standards: Comply with applicable standards of the InterNational Electrical Testing Association (NETA), including standard ATS.

B. Acceptance Testing: After installing equipment and BEFORE electrical circuitry has been energized. Demonstrate product capability and compliance with requirements.

3.3 DIVISION OF RESPONSIBILITY

A. The Electrical Testing Agency shall provide all material, equipment, labor and technical supervision to perform such tests and inspections as specified herein.

B. The Electrical Testing Agency is responsible for programming all protective and alarming devices with the proper settings provided by the ELECTRICAL SYSTEM PROTECTIVE DEVICE STUDY. Settings shall not be changed or applied to any device without written authorization from the Owner.
C. The Electrical Testing Agency shall notify the Commissioning Authority and Owner immediately upon the discovery of any defective equipment or incorrect system design or installation.

D. The Electrical Testing Agency shall provide an experienced person on-site during energizing, with appropriate test equipment to provide assistance in the event of a malfunction during the system start-up process.

3.4 ACCEPTANCE TESTING PROCEDURES

A. Testing and acceptance procedures for the equipment and systems listed in Part 1 shall be as described in the individual equipment specification sections listed above.

END OF SECTION 26 08 80
SECTION 26 09 13
LIGHTING CONTROL EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following types of lighting controls:

1. Time switches.
2. Photoelectric relays.
3. Occupancy Sensors.
4. Low-voltage control system components.
5. Central lighting control panel (internal relays and microprocessor based control).

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 26, Section 26 05 33, Raceway and Boxes for Electrical Systems, for general component identification and support requirements.
2. Division 26, Section 26 05 53, Identification for Electrical Systems, and general identification requirements.
3. Division 26, Section 26 08 00, Electrical Facility Startup / Commissioning, for turn-key startup of all programmable, networked, and/or software-based lighting control system(s).

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for lighting control equipment and systems components, including dimensions and data on features and components. Include wiring diagrams and elevation views of front panels of control and indicating devices. Include data on ratings. For flush control panels, submit color and finish options for selection. Also include the following:

1. Lists of ballast and lamp combinations compatible with dimmer systems, by manufacturer and catalog number.
2. Sound data, including operational tests of dimming systems.
3. Operational documentation for software.

C. Shop Drawings detailing assemblies of standard components, custom assembled for specific application on Project. Indicate dimensions, weights, arrangement of components, and clearance and access requirements.

D. Wiring diagrams detailing specific systems tailored to this Project and differentiating between factory-installed and field-installed wiring.

E. Field test reports indicating and interpreting test results specified in Part 3 of this Section.

F. Maintenance data for lighting control equipment and systems components to include in the operation and maintenance manual specified in Division 1.

G. Block Diagram: Show interconnections between components specified in this Section and devices furnished with power distribution system components. Indicate data communication paths and identify networks, data buses, data gateways, concentrators, and other devices to be used. Describe characteristics of network and other data communication lines.

H. Coordination Drawings: Submit evidence that lighting controls are compatible with connected monitoring and control devices and systems specified in other Sections.

1. Show interconnecting signal and control wiring and interfacing devices that prove compatibility of inputs and outputs.
2. For networked controls, list network protocols and provide statements from manufacturers that input and output devices meet interoperability requirements of the network protocol.

I. Software licenses and upgrades required by and installed for operation and programming of central lighting control panels “LCP’s”. Install software on the same personal computer “PC” workstation(s) as used for the monitoring and control as the Division 23 Facility Management System “FMS” / Energy Management System “EMS” / Building Automation System “BAS”.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For lighting controls to include in emergency, operation, and maintenance manuals.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On a magnetic media or compact disc, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.
1.5 QUALITY ASSURANCE

A. Electrical Component Standard: Provide components that comply with NFPA 70 and that are listed and labeled by UL where available.

B. Comply with FCC Regulations of Part 15, Subpart J for Class A.

C. Listing and Labeling: Provide products specified in this Section that are listed and labeled.

1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

1.6 SOFTWARE SERVICE AGREEMENT

A. Technical Support: Beginning with Substantial Completion, provide software support for three (3) years.

B. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within three (3) years from date of Substantial Completion. Upgrading software shall include operating system within the central lighting control panel “LCP”. Upgrade shall include new or revised licenses for use of the software.

1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

1.7 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Warranty: Submit a written warranty signed by manufacturer and Installer agreeing to replace programmable lighting control system components that fail in materials or workmanship within the specified warranty period.

C. Warranty Period: 2 years from date of Substantial Completion.
1.8 EXTRA MATERIALS

A. Furnish extra products as described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents. Deliver extra materials to Owner.

1. Relays: Single-pole mechanically held, 1 for every 4 installed. Furnish at least one of each type.
2. Dimmer Modules: 1 for every 4 of each type and rating installed. Furnish at least one of each type.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, provide one of the products specified on the drawings. Where no manufacturer is listed for the appropriate product category, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

1. Programmable, Low-Voltage Lighting Control Systems:
   a. Watt Stopper, Inc. (The)
   b. Lutron Electronics Co, Inc.
   c. Crestron Electronics, Inc.
   d. Cooper Greengate
   e. Hubbell Building Automation
   f. Lighting Control & Design (LC&D)
   g. nLight
   h. Acuity Brands Controls
   i. General Electric Company; Lighting Controls Division
   j. Electronic Theatre Controls Inc. (ETC)
   k. Synergy Lighting Controls
   l. Cooper iLumin
   m. Cooper Fifth Light

2. Programmable Breakers and Lighting Control Panelboards:
   a. Square D Co. – Power Link
   b. Eaton Corporation – Power Command
   c. Siemens Energy & Automation, Inc – P1 Series with I-3 Control
   d. General Electric Company; Electrical Distribution & Control Division – A Series
3. Contactors and Relays:
   a. Square D Co.
   b. Eaton Corporation
   c. General Electric Company
   d. Siemens

4. Time Switches:
   a. NSi Industries / Tork, Inc.
   b. Intermatic, Inc.

5. Photoelectric Relays:
   b. Area Lighting Research, Inc.
   c. Control Systems Engineering, Inc.
   d. Fisher Pierce
   e. Intermatic, Inc.
   f. Paragon Electric Co., Inc.
   g. SSAC, Inc.
   h. Tork, Inc.

6. Occupancy Sensors:
   a. Watt Stopper, Inc. (The)
   b. Hubbell Building Automation
   c. Cooper Greengate
   d. Sensor Switch, Inc.
   e. Lutron Electronics Co., Inc.
   f. General Electric Company; Lighting Controls Division

2.2 CONTACTORS AND RELAYS

A. Comply with NEMA ICS 2.

B. Description: Devices are electrically operated and mechanically held. Number of poles and ratings are as indicated. Coordinate rating of each unit with type of load served, including tungsten filament and inductive-type loads.

C. Modular Single-Pole Relays: Split-coil, momentary-pulsed type, knockout mounting.

1. Low-Voltage Leads: 5-pin plug connector.
4. Endurance: 50,000 cycles at rated capacity.
D. Modular Relay Panels: Steel cabinets, preassembled with modular single-pole relays, transformer power supplies, and associated components.

1. Barriers separate low-voltage and line-voltage components.
2. Cover: Hinged, lockable type.

2.3 TIME SWITCHES

A. Time Switches: Solid-state programmable units with alphanumeric display conforming to UL 917. Include the following features:

B. Time Switches: Electromechanical-dial type conforming to UL 917. Include the following features:

1. Astronomic dial.
2. Contacts: 2, rated 30 A at 277 VAC, except as otherwise indicated.
3. Pilot-Duty Contacts: 2, rated 2 A at 240 V, except as otherwise indicated.
4. Eight-Day Program: Uniquely programmable for each day of the week and holidays.
5. Skip-day mode.

2.4 PHOTOELECTRIC RELAYS

A. Conform to UL 773A.

B. Type: Solid-state, with SPDT dry contacts rated to operate relay or contactor coils to which connected.

C. Time delay prevents false operation.

D. Indoor Ceiling- or Wall-Mounted Units: Semiflush, calibrated to detect adequacy of daylighting in perimeter locations and arranged to turn artificial illumination on and off to suit varying intensities of available daylighting. Units are adjustable for turn-on/turn-off levels.

E. Indoor Skylight Units: Housed in a threaded plastic fitting for mounting under skylight, suitable for monitoring light levels from 0 to 3500 foot candles (0 to 37 673 lux), with an adjustment for turn-on/turn-off levels.

F. Outdoor Sealed Units: Weathertight housing, resistant to high temperatures and equipped with sun-glare shield and ice preventer.

2.5 OCCUPANCY SENSORS

A. General: Designed for type of mounting and space detection coverage requirements indicated. Connected to receive power from and operate a light switching relay in a separately mounted auxiliary power control unit, except as otherwise indicated.
B. Operation: Turns lights on when room or covered area is occupied and off when unoccupied, except as otherwise indicated.

2. Ambient-Light-Level Control: Adjustable to set a level of ambient illumination above which sensor will not turn lights on.
3. Isolated Relay Contact: Operates on detection of occupancy to activate an independent function.

C. Auxiliary Power Control Units: Relays are rated for a minimum of 20-A ballast load or 13-A tungsten lamp load. Sensor power supply is rated to supply number of sensor heads to which it is connected.

D. Passive Infrared Type: Occupancy is detected by a combination of heat and movement in zone of coverage. Each sensing head detects occupancy anywhere in an area of 1000 sq. ft. by detecting occurrence of 6-inch minimum movement of any portion of a human body that presents a minimum target of 36 sq. in. to sensor head.

E. Ultrasonic Type: Unit emits a beam of ultrasonic energy and detects occupancy through use of doppler principal in discerning movement in zone of coverage by sensing a change in pattern of reflected ultrasonic energy.

F. Dual-Technology Type: Unit uses a combination of passive infrared and ultrasonic detection methods to distinguish between occupied and unoccupied conditions for area covered. Particular technology or combination of technologies that controls each function (on or off) is selectable in field by operating controls on unit.

2.6 MANUAL SWITCHES AND PLATES

A. Switches: Specification grade, modular, momentary push-button, low-voltage type.

1. Color: White, except as otherwise indicated.
2. Integral Pilot Light: Indicates when circuit is on. Use where indicated.
3. Locator Light: Internal illumination helps locate switch in the dark. Use where indicated.
4. Wall Plates: Match those specified in Division 26, Section 26 2726, Wiring Devices to materials, finish, and color. Use multigang plates where more than one switch is indicated at a location.
5. Legend: Engraved or permanently silk-screened on wall plate where indicated. Use designations indicated on Drawings.

2.7 LOW-VOLTAGE WIRING

B. Low-Voltage Control Cable: Multiple conductor, color coded, No. 20 AWG copper.
   1. Sheath: Polyvinyl chloride (PVC), except in plenum-type spaces. In plenum-type spaces, use sheath listed for such use.
   2. Ordinary Switch Circuits: 3 conductors, except as otherwise indicated.
   3. Switch Circuits with Pilot Lights or Locator Feature: 5 conductors, except as otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION
A. Install equipment according to manufacturers' written instructions.
B. Mount control equipment according to manufacturers' instructions and Division 26, Section 26 2726, Wiring Devices.
C. Mounting heights indicated are to bottom of unit for suspended items and to center of unit for wall-mounted ones.

3.2 CONTROL WIRING INSTALLATION
A. Install wiring between control devices as specified in Division 26 Section 26 2726, Wiring Devices.
B. Wiring Method: Install all wiring in raceway as specified in Division 26, Section 26 0533, Raceway and Boxes for Electrical Systems.
C. Wiring Method: Install all wiring in raceway as specified in Division 26, Section 26 0533, Raceways and Boxes for Electrical Systems, except where run in accessible ceiling space, and gypsum board partitions.
D. Bundle, train, and support wiring in enclosures.
E. Grounding: Ground equipment. Tighten electrical connectors and terminals, including grounding connections, according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 IDENTIFICATION
A. Identify components and power and control wiring according to Division 26, Section 26 05 53, for Identification for Electrical Systems.
B. Label each system control module with a unique designation. Make designations on elevated components readable from floor.
3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Services: Provide services of a factory-authorized service representative to test, adjust, and program lighting control systems.

B. Reports: Prepare written reports of tests and observations. Report defective materials and workmanship and unsatisfactory test results. Record repairs and adjustments.

C. Test Labeling: After satisfactory completion of tests and inspections, apply a label to tested components indicating test results, date, and responsible organization and person.

D. Schedule visual and mechanical inspections and electrical tests with at least 7 days' advance notice.

E. Visual and Operational Inspections: Include the following inspections:
   1. Inspect control components for defects and physical damage, NRTL labeling, and nameplate compliance with current Project Drawings.
   2. Check tightness of electrical connections with torque wrench calibrated within previous 6 months. Use manufacturer's recommended torque values.
   3. Verify settings of photoelectric devices with photometer calibrated to National Institute for Science and Technology (NIST) standards within past 6 months.
   4. Exercise and perform operational tests on mechanical parts and operable devices according to manufacturer's instructions for routine functional operation.

F. Electrical Tests: Use particular caution when testing devices containing solid-state components. Perform the following tests according to manufacturer's instructions:
   1. Continuity tests of circuits.
   2. Operational Tests: Set and operate controls to demonstrate controls in a methodical sequence that cues and reproduces actual operating functions. Include testing of dimming equipment and ambient-light, programmable, and occupancy controls under conditions that simulate actual operational conditions. Record control settings, operations, cues, and functional observations.

G. Correct deficiencies disclosed by inspections and tests, make necessary adjustments, and retest deficient items. Verify that specified requirements are met.

3.5 ADJUSTING AND CLEANING

A. Occupancy Adjustments: Upon request within 1 year of date of Substantial Completion, make up to 3 on-site visits to Project site to assist in adjusting light levels, making program changes, and adjusting sensors and controls.

B. Repair scratches and mars of finish to match original finish. Clean equipment and devices internally and externally using methods and materials recommended by manufacturers.
3.6 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Confirm correct communication wiring, initiate communications between panels, and program the lighting control system according to approved zone configuration schedules, time-of-day schedules, and input override assignments.

3.7 DEMONSTRATION

A. Training: Provide services of a factory-authorized service representative to demonstrate programmable lighting control system and to train Owner's maintenance personnel.

1. Train Owner's personnel to operate, service, maintain, adjust, and program equipment and system components. Allow at least 8 hours to conduct training. Schedule training with at least 7 days' advance notice. Use final approved operation and maintenance manual as a training aid throughout training. Use both classroom training and hands-on exercises.

END OF SECTION 26 09 13
SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes various types of receptacles, connectors, switches, and finish plates.

1.3 SUBMITTALS

A. Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each product specified, including all information required to show compliance with all requirements.

C. Shop Drawings: Legends for receptacles and switch plates.

D. Samples of devices, device plates, and telephone/power service poles for color selection and evaluation of technical features.

E. Operation and maintenance data for materials and products specified in this Section to include in the "Operating and Maintenance Manual" specified in Division 1.

1.4 QUALITY ASSURANCE

A. Comply with NFPA 70, National Electrical Code for devices and installation.

B. Listing and Labeling: Provide products that are listed and labeled for their applications and installation conditions and for the environments in which installed.

1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
1.5 COORDINATION

A. Wiring Devices for Owner Furnished Equipment: Match devices to plug connectors for Owner-furnished equipment.

B. Cord and Plug Sets: Match cord and plug sets to equipment requirements.

1.6 EXTRA MATERIALS

A. Furnish the following extra materials, packaged with protective covering for storage, and identified with labels describing contents. Deliver extra materials to the Owner.

1. Telephone/Power Service Poles: 1 for each 10, but not less than 1.
2. Floor Service Outlet Assemblies: 1 for each 10, but not less than 1.
3. Poke-Through Fire-Rated Closure Plugs: 1 for each 5 floor service outlets installed, but not less than 2.
4. Transient-Voltage Surge-Suppressor Receptacles: 1 for each 8 installed, but not less than 2.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Wiring Devices:
   a. Arrow Hart Div., Cooper Industries
   b. Bryant Electric, Inc.
   d. General Electric Co.
   e. Hubbell Inc.
   f. Leviton Mfg. Co., Inc.
   g. Pass & Seymour/Legrand

2. Wiring Devices for Hazardous (Classified) Locations:
   a. Crouse-Hinds Electrical Construction
   c. Pyle-National Co.

3. Multi-Outlet Assemblies:
   a. Airey-Thompson Co., Inc.
   b. Dual-Lite
   c. Isoduct Energy Systems
d. Kellems Div., Hubbell, Inc.
e. Wiremold Co.

4. Poke-Through, Floor Service Outlets, and Telephone/Power Poles:
   a. American Electric
   b. Hubbell, Inc.
   c. Pass & Seymour/LeGrand
   d. Square D Co.
   f. Wiremold Co.

2.2 WIRING DEVICES

A. Comply with NEMA Standard WD 1, "General Purpose Wiring Devices."

B. Enclosures: NEMA 1 equivalent, except as otherwise indicated.

C. Color: By Architect except as otherwise indicated or required by Code.

D. Receptacles, Straight-Blade and Locking Type: Except as otherwise indicated, comply with Federal Specification W-C-596 and heavy-duty grade of UL Standard 498, "Electrical Attachment Plugs and Receptacles." Provide NRTL labeling of devices to verify these compliances. 20A unless noted otherwise.

E. Receptacles, Straight-Blade, Hospital Grade: Listed and labeled for compliance with Hospital Grade of UL Standard 498, "Electrical Attachment Plug and Receptacle," and Federal Specification W-C-598. 20A unless noted otherwise.

F. Receptacles, Straight-Blade, Special Features: Comply with the basic requirements specified above for straight-blade receptacles of the class and type indicted, and with the following additional requirements:


2. Isolated Ground Receptacles: Equipment grounding contacts are connected only to the green grounding screw terminal of the device and have inherent electrical isolation from the mounting strap.

   a. Devices: Listed and labeled as isolated ground receptacles.
   b. Isolation Method: Integral to the receptacle construction and not dependent on removable parts.
3. Transient-Voltage Surge-Suppressor (TVSS) Receptacles: Duplex type, NEMA 5-20R configuration, with integral transient-voltage surge protection in a minimum of 3 modes: line-to-ground, line-to-neutral, and neutral-to-ground; listed as complying with UL Standard 1449 "Transient Voltage Surge Suppressors."

a. Surge Protection Components: Multiple metal-oxide varistors, rated for 500 V transient suppression voltage nominal clamp level and minimum single transient pulse energy dissipation of 140 J, line-to-neutral, and 70 J, line-to-ground and neutral-to-ground.

b. Active Protection Indication: A light visible in the face of the device indicates the state of the device as "active" or "no longer active."

c. Identification: Distinctive marking on face of device denotes transient-voltage surge-suppressor type unit.

G. Receptacles, Industrial Heavy-Duty: Conform to NEMA Standard PK 4 "Plugs, Receptacles, and Cable Connectors of the Pin and Sleeve Type for Industrial Use."

H. Receptacles in Hazardous (Classified) Locations: Comply with NEMA Standard FB 11 "Plugs, Receptacles, and Connectors of the Pin and Sleeve Type for Hazardous Locations" and UL Standard 1010 "Receptacle-Plug Combinations for Use in Hazardous (Classified) Locations."

I. Pendant Cord/Connector Devices: Matching, locking type, plug and plug receptacle body connector, NEMA L5-20P and L5-20R, heavy-duty grade.


2. External Cable Grip: Woven wire mesh type made of high-strength galvanized-steel wire strand and matched to cable diameter and with attachment provision designed for the corresponding connector.

J. Cord and Plug Sets: Match voltage and current ratings and number of conductors to requirements of the equipment being connected.

1. Cord: Rubber-insulated, stranded copper conductors, with type SOW-A jacket. Grounding conductor has green insulation. Ampacity is equipment rating plus 30 percent minimum.

2. Plug: Male configuration with nylon body and integral cable-clamping jaws. Match to cord and to receptacle type intended for connection.


L. Snap Switches in Hazardous (Classified) Locations: Comply with UL Standard 894, "Switches for Use in Hazardous (Classified) Locations."
M. Dimmer Switches: Modular full-wave solid-state units with integral, quiet on-off switches, and audible and electromagnetic noise filters.

1. Wattage rating exceeds connected load by 30 percent minimum, except as otherwise indicated.
2. Control: Continuously adjustable slide OR toggle. Single-pole or 3-way switch to suit connections.
3. Incandescent Lamp Dimmers: Modular dimmer switches for incandescent fixtures; switch poles and wattage as otherwise indicated, 120 V, 60 Hz with continuously adjustable, toggle, or slide, single-pole with soft tap or other quiet switch. Equip with electromagnetic filter to eliminate noise, RF and TV interference, and 5-inch wire connecting leads. As manufactured by Lutron Nova.
4. Fluorescent Lamp Dimmers: Modular dimmer switches compatible with dimmer ballasts. Trim potentiometer adjusts low-end dimming. Dimmer-ballast combination is capable of consistent dimming to a maximum of 10 percent of full brightness. As manufactured by Lutron Nova.

N. Weatherproof Receptacles: Duplex receptacles, comply with basic requirements above. Cast metal box, cover plate, and cover to provide weatherproof capability with plugs and cords installed.

O. Wall Plates: Single and combination types that mate and match with corresponding wiring devices. Features include the following:

1. Color: Matches wiring device except as otherwise indicated.
2. Plate-Securing Screws: Metal with heads colored to match plate finish.

2.3 FLOOR SERVICE OUTLET ASSEMBLIES

A. Types: Modular, above-floor, dual-service units suitable for the wiring method used.

B. Compartmentation: Barrier separates power and signal compartments.

C. Housing Material: Die-cast aluminum, satin finished.

D. Power Receptacle: NEMA configuration 5-20R, gray finish, except as otherwise indicated.

E. Signal Outlet: Blank cover with bushed cable opening, except as otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install devices and assemblies plumb and secure.
B. Install wall plates when painting is complete.

C. Arrangement of Devices: Except as otherwise indicated, mount flush, with long dimension vertical, and grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

D. Protect devices and assemblies during painting.

E. Adjust locations at which floor service outlets and telephone/power service poles are installed to suit the indicated arrangement of partitions and furnishings.

3.2 IDENTIFICATION

A. Comply with Division 26, Section 26 0553, Identification for Electrical Systems.

1. Switches: Where 3 or more switches are ganged, and elsewhere where indicated, identify each switch with approved legend engraved on wall plate.

2. Receptacles: Identify the panelboard and circuit number from which served. Use machine-printed, pressure-sensitive, abrasion-resistant label tape on face of plate and durable wire markers or tags within outlet boxes.

3.3 GROUNDING

A. Isolated Ground Receptacles: Connect to isolated grounding conductor routed to designated isolated equipment ground terminal of electrical system.

B. Equipment Ground: Connect to device and to box.

3.4 FIELD QUALITY CONTROL

A. Testing: Test wiring devices for proper polarity and ground continuity. Operate each operable device at least 6 times.

B. Check TVSS receptacle indicating lights for normal indication.

C. Test ground-fault circuit interrupter operation with both local and remote fault simulations according to manufacturer recommendations.

D. Replace damaged or defective components.
3.5 CLEANING

A. General: Internally clean devices, device outlet boxes, and enclosures. Replace stained or improperly painted wall plates or devices. Replace wall plates or devices marked with pencil, pen, or other non-standard marking system. Thoroughly clean all device plates, remove fingerprints, smudges, and dirt.

END OF SECTION 26 27 26
SECTION 26 28 16

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes individually mounted switches and circuit breakers used for the following:

1. Service disconnect switches.
2. Feeder and equipment disconnect switches.
3. Feeder branch-circuit protection.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 26, Section 26 2726, Wiring Devices, for attachment plugs and receptacles, and snap switches used for disconnect switches.
2. Division 26, Section 26 2413, Switchboards, for individually enclosed, fused power-circuit devices used as feeder disconnect switches.
3. Division 26, Section 26 2813, Fuses, for fuses in fusible disconnect switches.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product Data for switches, circuit breakers, and accessories specified in this Section. Include the following:

1. Descriptive data, time-current curves, and short circuit interrupting capacity.
2. Let-through current curves for circuit breakers with current-limiting characteristics.
3. Coordination charts and tables and related data.

C. Wiring diagrams detailing wiring for power and control systems and differentiating between manufacturer-installed and field-installed wiring.
D. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

E. Field test reports indicating and interpreting test results.

F. Maintenance data for tripping devices to include in the operation and maintenance manual specified in Division 1.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain disconnect switches and circuit breakers from one source and by a single manufacturer.

B. Comply with NFPA 70 for components and installation.

C. Listing and Labeling: Provide disconnect switches and circuit breakers specified in this Section that are listed and labeled.
   1. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide disconnect switches and circuit breakers by one of the following:
   1. Fusible Switches:
      a. Eaton Corp.; Cutler-Hammer Products
      b. General Electric Co.; Electrical Distribution and Control Division
      c. General Switch Corp.
      d. Siemens Energy & Automation, Inc.
      e. Square D Co.
   2. Molded-Case Circuit Breakers:
      a. Eaton Corp.; Cutler-Hammer Products
      b. General Electric Co.; Electrical Distribution and Control Division
      c. General Switch Corp.
      d. Siemens Energy & Automation, Inc.
      e. Square D Co.
3. **Combination Circuit Breaker and Ground Fault Trip:**
   a. American Circuit Breaker Corp.
   b. General Electric Co.; Electrical Distribution and Control Division
   c. Siemens Energy & Automation, Inc.
   d. Square D Co.

4. **Molded-Case, Current-Limiting Circuit Breakers:**
   a. General Electric Co.; Electrical Distribution and Control Division
   b. Siemens Energy & Automation, Inc.
   c. Square D Co.
   d. Westinghouse Electric Corp.; Distribution & Control Business Unit

5. **Integrally Fused, Molded-Case Circuit Breakers:**
   a. General Electric Co.; Electrical Distribution and Control Division
   b. Siemens Energy & Automation, Inc.
   c. Westinghouse Electric Corp.; Distribution & Control Business Unit

2.2 **DISCONNECT SWITCHES**

A. **Enclosed, Nonfusible Switch:** NEMA KS 1, Type HD with lockable handle.

B. **Enclosed, Fusible Switch, 800 A and Smaller:** NEMA KS 1, Type HD, clips to accommodate specified fuses, enclosure consistent with environment where located, handle lockable with 2 padlocks, and interlocked with cover in CLOSED position.

C. **Enclosure:** NEMA KS 1, Type 1, unless otherwise specified or required to meet environmental conditions of installed location.
   1. Outdoor Locations: Type 3
   3. Other Wet or Damp Indoor Locations: Type 3

2.3 **ENCLOSED CIRCUIT BREAKERS**

A. **Enclosed, Molded-Case Circuit Breaker:** NEMA AB 1, with lockable handle.

B. **Characteristics:** Frame size, trip rating, number of poles, and auxiliary devices as indicated and interrupting rating to meet available fault current.

C. **Application Listing:** Appropriate for application, including switching fluorescent lighting loads or heating, air-conditioning, and refrigerating equipment.

D. **Circuit Breakers, 200 A and Larger:** Trip units interchangeable within frame size.

F. Current-Limiting Trips: Where indicated, let-through ratings less than NEMA FU 1, Class RK-5.


H. Molded-Case Switch: Where indicated, molded-case circuit breaker without trip units.

I. Lugs: Mechanical lugs and power-distribution connectors for number, size, and material of conductors indicated.

J. Shunt Trip: Where indicated.

K. Accessories: As indicated.

L. Enclosure: NEMA AB 1, Type 1, unless otherwise specified or required to meet environmental conditions of installed location.

1. Outdoor Locations: Type 3.

2. Other Wet or Damp Indoor Locations: Type 3

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install disconnect switches and circuit breakers in locations as indicated, according to manufacturer's written instructions.

B. Install disconnect switches and circuit breakers level and plumb.

C. Install wiring between disconnect switches, circuit breakers, control, and indication devices.

D. Connect disconnect switches and circuit breakers and components to wiring system and to ground as indicated and instructed by manufacturer.

1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

E. Identify each disconnect switch and circuit breaker according to requirements specified in Division 26, Section 26 05 53, Identification for Electrical Systems.
3.2 FIELD QUALITY CONTROL

A. Testing: After installing disconnect switches and circuit breakers and after electrical circuitry has been energized, demonstrate product capability and compliance with requirements.

1. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA ATS, Section 7.5 for disconnect switches and Section 7.6 for molded-case circuit breakers. Certify compliance with test parameters.

B. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

3.3 ADJUSTING

A. Set field-adjustable disconnect switches and circuit-breaker trip ranges as indicated.

3.4 CLEANING

A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish including chips, scratches, and abrasions.

END OF SECTION 26 28 16
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes interior lighting fixtures, lamps, ballasts, emergency lighting units, and accessories.

B. Related Sections: The following Sections contain requirements that relate to this Section:

   1. Division 26, Section 26 56 12, Exterior Lighting for exterior security lighting, roadway and parking lot lighting, poles, and standards.
   2. Division 26, Section 26 09 13, Lighting Control Equipment for modular dimmers, programmable lighting control systems, time switches, photoelectric relays, occupancy sensors, power relays, and contractors.

1.3 DEFINITIONS

A. Emergency Lighting Unit: A fixture with integral emergency battery-powered supply and the means for controlling and charging the battery. It is also known as an emergency light set.

B. Fixture: A complete lighting unit, exit sign, or emergency lighting unit. Fixtures include all mounting devices, lamps, and parts required to distribute light, position and protect lamps, and connect lamps to power supply. Internal battery-powered exit signs and emergency lighting units also include a battery and the means for controlling and recharging the battery. Emergency lighting units include ones with and without integral lamp heads.

C. Average Life: The time after which 50 percent fails and 50 percent survives under normal conditions.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
B. Product Data describing fixtures, lamps, ballasts, and emergency lighting units. Arrange Product Data for fixtures in order of fixture designation. Include data on features and accessories and the following:

1. Outline drawings indicating dimensions and principal features of fixtures.
2. Electrical Ratings and Photometric Data: Certified results of laboratory tests for fixtures and lamps.
3. Battery and charger data for emergency lighting units.

C. Shop Drawings detailing nonstandard fixtures and indicating dimensions, weights, method of field assembly, components, features, and accessories.

D. Wiring diagrams detailing wiring for control system showing both factory-installed and field-installed wiring for specific system of this Project, and differentiating between factory-installed and field-installed wiring.

E. Coordination Drawings showing fixtures mounted on, in, or above ceiling. Indicate coordination with ceiling grids and other equipment installed in vicinity.

F. Air and thermal performance data for air-handling fixtures.

G. Sound performance data for air-handling fixtures. Provide certified test reports indicating sound power level and Sound Transmission Class (STC).

H. Product certificates signed by manufacturers of lighting fixtures certifying that their products comply with specified requirements.

I. Field test reports indicating and interpreting test results specified in Part 3 of this Section.

J. Maintenance data for fixtures to include in the operation and maintenance manual specified in Division 1.

1.5 QUALITY ASSURANCE

A. Electrical Component Standard: Provide components that comply with NFPA 70 and that are listed and labeled by UL where available.

B. Listing and Labeling: Provide fixtures, emergency lighting units, and accessory components specified in this Section that are listed and labeled for their indicated use and installation conditions on Project.

1. Special Listing and Labeling: Provide fixtures for use in damp or wet locations, underwater, and recessed in combustible construction that are specifically listed and labeled for such use. Provide fixtures for use in hazardous (classified) locations that are listed and labeled for the specific hazard.

2. The Terms "Listed" and "Labeled": As defined in the National Electrical Code, Article 100.
C. Fixtures for Hazardous Locations: Conform to UL 844. Provide units that have Factory Mutual Engineering and Research Corporation (FM) certification for indicated class and division of hazard.

D. Emergency Ballasts: Conform to UL924.

E. Coordinate fixtures, mounting hardware, and trim with ceiling system and other items, including work of other trades, required to be mounted on ceiling or in ceiling space.

1.6 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Warranty for Batteries: Submit a written warranty executed by the manufacturer agreeing to replace rechargeable system batteries that fail in materials or workmanship within the specified warranty period.

1. Special Warranty Period: Manufacturer's standard but not less than 10 years after date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for last 9 years.

C. Warranty for LED Fixtures: 5 years from date of manufacturer against defects in material or workmanship. This warranty shall include all components including drivers, whether mounted internally or externally to the fixture housing.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.

B. Lamps: 20 lamps for every 100 of each type and rating installed. Furnish at least ten (10) of each type.

C. Plastic Diffusers and Lenses: 10 for every 100 of each type and rating installed. Furnish at least five (5) of each type.

D. Ballasts: 5 for every 100 of each type and rating installed. Furnish at least five (5) of each type.

E. Globes and Guards: 5 for every 20 of each type and rating installed. Furnish at least three (3) of each type.
PART 2 PRODUCTS

2.1 MANUFACTURERS
   A. Products: Subject to compliance with requirements, provide one of the products specified in each
      Luminaire Schedule on drawings.

2.2 FIXTURES AND FIXTURE COMPONENTS, GENERAL
   A. Metal Parts: Free from burrs, sharp corners, and edges.
   B. Sheet Metal Components: Steel, except as indicated. Form and support to prevent warping and
      sagging.
   C. Doors, Frames, and Other Internal Access: Smooth operating, free from light leakage under
      operating conditions, and arranged to permit relamping without use of tools. Arrange doors, frames,
      lenses, diffusers, and other pieces to prevent accidental falling during relamping and when secured in
      operating position.
   D. Reflecting Surfaces: Minimum reflectance as follows, except as otherwise indicated:
      1. White Surfaces: 85 percent.
      2. Specular Surfaces: 83 percent.
      3. Diffusing Specular Surfaces: 75 percent.
      4. Laminated Silver Metallized Film: 90 percent.
   E. Lenses, Diffusers, Covers, and Globes: 100 percent virgin acrylic plastic or water white, annealed
      crystal glass, except as otherwise indicated.
      1. Plastic: High resistance to yellowing and other changes due to aging, exposure to heat, and
         UV radiation.
      2. Lens Thickness: 0.125 inch minimum; except where greater thickness is indicated.
   F. Fixture Support Components: Comply with Division 26, Section 260500, Common Work Results
      for Electrical.
         Finish same as fixture.
      2. Rod Hangers: 3/16-inch- minimum diameter, cadmium-plated, threaded steel rod.
      3. Hook Hanger: Integrated assembly matched to fixture and line voltage and equipped with
         threaded attachment, cord, and locking-type plug.
   G. Fluorescent Fixtures: Conform to UL 1570.
H. Fluorescent Ballasts: Electronic integrated circuit, high frequency, solid-state, full-light-output, energy-efficient type compatible with lamps and lamp combinations to which connected.

1. Certification by Electrical Testing Laboratory (ETL).
2. Labeling by Certified Ballast Manufacturers Association (CBM).
3. Type: Class P, high power factor, except as otherwise indicated.
5. Voltage: Match connected circuits.
6. Lamp Flicker: Less than 5 percent.
7. Minimum Power Factor: 90 percent.
8. Total Harmonic Distortion (THD) of Ballast Current: Less than 20 percent.
9. Total Harmonic Distortion (THD) of Ballast Current: Less than 10 percent.
11. Conform to IEEE C62.41, Category A, for resistance to voltage surges for normal and common modes.
12. Multilamp Ballasts: Use 2, 3, or 4 lamp ballasts for multilamp fixtures where possible.
13. Lamp-ballast connection method does not reduce normal rated life of lamps.
14. Low-Temperature Fluorescent Ballasts: For temperatures less than 0°C, comply with above requirements, except ballast may be Class P electromagnetic type. Starting temperature is minus 20 deg C or colder.
15. Dimming Ballasts: Electronic type providing smooth dimming over a minimum range from 100 to 5 percent light output. Listed for use with specific fluorescent dimming system provided. Dimming systems are specified in Division 26, Section 26 0913, Lighting Control Equipment. Fluorescent wall dimmers are specified in Division 26, Section 26 2726, Wiring Devices.

I. Electromagnetic Interference (EMI) Filters: Integral to fixture assembly. Provide one filter for each ballast. Suppress EMI as required by MIL-STD-461.

J. LED Fixtures:

1. Photometric measurements indicated on product data shall be provided in accordance with IESNA LM-79-08 Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products and shall meet the requirements specified and / or indicated on the Drawings.
2. Lumen data indicated on product data sheets shall be generated in accordance with IESNA LM-80-08 IES Approved Method for Measuring Lumen Maintenance of LED Light Sources and shall meet the requirements specified and / or indicated on the Drawings.
3. Lumen depreciation shall be identified in terms of IES TM-21-11. Luminaires shall provide a minimum L70 rating of 75,000 hours at the rated drive current.
4. Correlated color temperature (CCT) indicated on the product data sheets shall be provided in accordance with ANSI C78.377-2008 American National Standard for Electric Lamps—Specifications for the Chromaticity of Solid State Lighting (SSL) Products and shall meet the requirements specified and / or indicated on the Drawings. Acceptable variation in color temperatures specified shall be +/- 275K.
5. Lumen output specified shall be lumens delivered from the luminaire at the color temperature specified.
6. Luminaires efficacy shall meet that specified / scheduled at the CCT specified.
K. LED Drivers:
   1. Drivers shall be universal voltage (120-277 volt) or shall be 120 volt, or 240 volt as required to meet project / branch circuit conditions.
   2. Drivers shall be equipped with quick disconnect.
   3. Power factor > 0.9.
   4. Harmonic distortion < 20%.
   5. Ambient temperature range: 104 degrees F to -30 degrees F.
   6. UL listed.
   7. See schedule on Drawings for additional information.

L. High-Intensity-Discharge (HID) Fixtures: Conform to UL 1572.

M. HID Ballasts: Conform to UL 1029 and ANSI C82.4. Include the following features, except as otherwise indicated.
   1. Constant wattage auto-transformer (CWA) or regulating high-power-factor type, unless otherwise indicated.
   2. Operating Voltage: Match system voltage.
   4. Normal Ambient Operating Temperature: 40 deg C.
   5. Open circuit operation will not reduce average life.
   6. High-Pressure Sodium (HPS) Ballasts: Equip with a solid-state igniter/starter having an average life in pulsing mode of 10,000 hours at an igniter/starter case temperature of 90 deg C.
   7. Encapsulation: Manufacturer's standard epoxy-encapsulated model designed to minimize audible fixture noise.

N. Instant Restrike Device: Solid-state, potted module, mounted inside HPS fixture and compatible with HPS lamps, ballasts, and sockets up to 150 W.
   1. Restrike Range: 105 to 130 VAC.
   2. Maximum Voltage: 250 V peak or 150 VAC RMS.

O. Auxiliary, Instant-On, Quartz System: Automatically switches quartz lamp when fixture is initially energized and when momentary power outages occur. Turns quartz lamp off automatically when HID lamp reaches approximately 60 percent light output.

P. Incandescent Fixtures: Conform to UL 1571.

Q. Track-Lighting Systems: Conform to UL 1574. Provide components, including track, fittings, and fixtures, from same manufacturer and as recommended by manufacturer for intended use.

R. Stage- or Studio-Type Lighting Equipment: Conform to UL 1573.

S. Exit Signs: Conform to UL 924 and the following:
   1. Sign Colors: Conform to local code, or as selected by the Architect.
2. Minimum Height of Letters: Conform to local code.
3. Arrows: Include as indicated.
4. Lamps for AC Operation: Light-emitting diodes (LED), 70,000 hours minimum rated life.

T. Emergency Lighting Units: Conform to UL 924. Provide self-contained units with the following features:
   1. Battery: Sealed, maintenance-free, lead-acid type with minimum 10-year nominal life and special warranty.
   2. Charger: Minimum 2-rate, fully automatic, solid-state type, with sealed transfer relay.
   3. Operation: Relay automatically turns lamp on when supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. Relay disconnects lamps and battery and automatically recharges and floats on trickle charger when normal voltage is restored.
   4. Wire Guard: Where indicated, provide heavy-chrome-plated wire guard arranged to protect lamp heads or fixtures.
   5. Time-Delay Relay: Provide time-delay relay in emergency lighting unit control circuit arranged to hold unit ON for fixed interval after restoration of power after an outage. Provide adequate time delay to permit HID lamps to restrike and develop adequate output.

U. Emergency Fluorescent Power Supply Unit: Conform to UL 924.
   1. Internal Type: Self-contained, modular, battery-inverter unit factory mounted within fixture body.
      a. Test Switch and LED Indicator Light: Visible and accessible without opening fixture or entering ceiling space. Test switch interrupts normal power to fixture.
      b. Battery: Sealed, maintenance-free, nickel-cadmium type with minimum 10-year nominal life, for 0°C to 55°C operating condition.
      c. Charger: Fully automatic, solid-state, constant-current type.
      d. Operation: Relay automatically turns lamp on when supply circuit voltage drops to 80 percent of nominal voltage or below. Relay disconnects lamp and battery and automatically recharges when normal voltage is restored.
      e. Output: Full illumination [up to 3000 lumens for 4’ fixtures. 1050 lumens for compact fluorescent fixture.
      f. Test: Self test feature with pre-programmed 30 second and 90 minute test sequences with alarm beeper and flashing light.
   2. External Type: Self-contained, modular, battery-inverter unit.
      a. Test Switch and LED Indicator Light: Visible and accessible without entering ceiling space.
      b. Battery: Sealed, maintenance-free, nickel-cadmium type with minimum 10-year nominal life.
      c. Charger: Fully automatic, solid-state, constant-current type.
      d. Operation: Relay automatically turns lamp on when supply circuit voltage drops to 80 percent of nominal voltage or below. Battery automatically recharges when normal voltage is restored.
V. Ballast Disconnect: Conform to UL 2459 and the following:

1. Location: Indoor, normal and emergency lighting circuits.
2. Luminaires: Fluorescent utilizing double-ended loops or ballasted luminaries supplied from multi-wire branch circuits. Internal or external to each fixture; accessible to qualified persons before servicing or maintaining the ballast.
3. Installation: Provide at the source of supply to disconnect all supply conductors to the ballast.
4. Housing: Polycarbonate with integral latch, designed so mating halves connect only in one way to ensure electrical polarization.
5. Identification: Clear markings indicating line and load on each half of connector.
6. Wire Leads: No. 189 AWG solid copper, insulated, minimum.

2.3 LAMPS

A. Comply with ANSI C78 series that is applicable to each type of lamp.

B. Fluorescent Color Temperature and Minimum Color-Rendering Index (CRI): 3500 K and 82 CRI, except as otherwise indicated.

C. Noncompact Fluorescent Lamp Life: Rated average is 20,000 hours at 3 hours per start when used on rapid start circuits.

D. LED Color Temperature and Minimum Color-Rendering Index (CRI): 3500 K and 82 CRI, except as otherwise indicated.

E. Metal Halide Color Temperature and Minimum Color-Rendering Index (CRI): 3600 K and 70 CRI, except as otherwise indicated.

2.4 FINISHES

A. Manufacturer's standard, except as otherwise indicated, applied over corrosion-resistant treatment or primer, free of streaks, runs, holidays, stains, blisters, and similar defects.

PART 3 EXECUTION

3.1 INSTALLATION

A. Set units plumb, square, and level with ceiling and walls, and secure according to manufacturer's written instructions and approved Shop Drawings. Support fixtures according to requirements of Division 26, Section 26 0500, Common Work Results for Electrical, and 26 0529, Hangers and Supports for Electrical Systems.
B. Support for Recessed and Semi-recessed Grid-Type Fluorescent Fixtures: Units may be supported from suspended ceiling support system. Install ceiling support system rods or wires at a minimum of 4 rods or wires for each fixture, located not more than 6 inches from fixture corners.

1. Install support clips for recessed fixtures, securely fastened to ceiling grid members, at or near each fixture corner.
2. Fixtures Smaller than Ceiling Grid: Install a minimum of 4 rods or wires for each fixture and locate at corner of ceiling grid where fixture is located. Do not support fixtures by ceiling acoustical panels.
3. Fixtures of Sizes Less than Ceiling Grid: Center in acoustical panel. Support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.

C. Support for Suspended Fixtures: Brace pendants and rods over 48 inches long to limit swinging. Support stem-mounted, single-unit, suspended fluorescent fixtures with twin-stem hangers. For continuous rows, use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of chassis, including one at each end.

D. Air-Handling Fixtures: Install with dampers closed.

E. Lamping: Where specific lamp designations are not indicated, lamp units according to manufacturer's instructions.

3.2 CONNECTIONS

A. Ground lighting units. Tighten electrical connectors and terminals, including grounding connections, according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.3 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replaced damaged fixtures and components.

B. Give advance notice of dates and times for field tests.

C. Provide instruments to make and record test results.

D. Tests: Verify normal operation of each fixture after fixtures have been installed and circuits have been energized with normal power source. Interrupt electrical energy to demonstrate proper operation of emergency lighting installation. Include the following information in tests of emergency lighting equipment:

1. Duration of supply.
2. Low battery voltage shutdown.
3. Normal transfer to battery source and retransfer to normal.
4. Low supply voltage transfer.
E. Replace or repair malfunctioning fixtures and components, then retest. Repeat procedure until all units operate properly.

F. Report results of tests.

G. Replace fixtures that show evidence of corrosion during Project warranty period.

3.4 ADJUSTING AND CLEANING

A. Clean fixtures after installation. Use methods and materials recommended by manufacturer.

B. Adjust aimable fixtures to provide required light intensities.

C. Adjust exit sign directional arrows as indicated on drawings or required by project conditions.

3.5 STARTUP AND COMMISSIONING

A. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

B. Operate fluorescent and high intensity discharge lamps at 100% light output for 100 hours upon initial energization.

C. Repair or replace defective components.

3.6 OWNER INSTRUCTION AND DEMONSTRATION

A. Review procedures for lamp replacement at each luminaire.

B. Review manufacturer’s suggestions for lamp replacement (for example: group re-lamping, scheduled re-lamping, etc.)

C. Review luminaires with remote ballasts, transformers, LED drivers, etc.

D. Review different ballast types installed. Review ballasts with different ballasts factors and starting methods.

E. Review Contractor’s one year warranty, and manufacturer’s Warranty for lamps, ballasts, drivers, and LEDs.

F. Obtain a signed receipt for “Extra Materials.”
3.7 INTERIOR LIGHTING FIXTURE SCHEDULE

A. The luminaire schedule located in the construction drawings describes each type of luminaire for the project. Manufacturer’s catalog numbers are given for convenience. Where discrepancies occur between catalog numbers and the discipline information, the descriptive information shall take precedence. Some required features, options, accessory equipment or special order requirements may not be included in the catalog number.

END OF SECTION 26 51 13
PART 1 - GENERAL

1.1 SUMMARY

A. The work covered by this Section shall include all labor, equipment, materials, ancillary materials and services to furnish, install, test, and turnover components establishing a complete and operational microprocessor-based Access Control System (ACS), as described herein and in the contract drawings. This section includes specifications for an electronic access control system, which shall perform the following general services:

1. Access Control.

1.2 REFERENCES

A. Abbreviations and Acronyms

1. TCP/IP: Transport control protocol/Internet protocol incorporated into Microsoft Windows.
2. UPS: Uninterruptible power supply.
3. WAN: Wide area network.
4. RF: Radio frequency.
5. I/O: Input/Output.
6. LAN: Local area network.
7. LED: Light-emitting diode.
8. CPU: Central processing unit.
9. ACS: Access control system.
10. CCTV: Closed-circuit television.

B. Definitions

1. ABA Track: Magnetic stripe that is encoded on track2, at 75-bpi density in binary-coded decimal format; for example, 5-bit, 16-character set.
2. Central Station: A PC with software designated as the main controlling PC of the security access system. Where this term is presented with initial capital letters, this definition applies.
3. Controller: An intelligent reader control panel that uses a computer for controlling its operation. Where this term is presented with an initial capital letter, this definition applies.
4. Credential: Data assigned to an entity and used to identify that entity.
5. DTS: Digital Termination Service: A microwave-based, line-of-sight communications provided directly to the end user.
6. File Server: A PC in a network that stores the programs and data files shared by users.
7. Identifier: A credential card, keypad personal identification number or code, biometric characteristic, or other unique identification entered as data into the entry-control database for the purpose of identifying an individual. Where this term is presented with an initial capital letter, this definition applies.
8. Location: A Location on the network having a PC-to-Controller communications link. Where this term is presented with an initial capital letter, this definition applies.
9. PCI Bus: Peripheral Component Interconnect; a peripheral bus providing a high-speed data path between the CPU and peripheral devices (such as monitor, disk drive, or network).
10. ROM: Read-only memory. ROM data is maintained through losses of power.
11. RS-232: A TIA/EIA standard for asynchronous serial data communications between terminal devices. This standard defines a 25 pin connector and certain signal characteristics for interfacing computer equipment.
13. WAV: The digital audio format used in Microsoft Windows.
14. Wiegand: Patented magnetic principle that uses specially treated wires embedded in the credential card.
15. Workstation: A PC with software that is configured for specific limited security system functions.

C. Reference Standards

1. FCC: All assemblies shall be in compliance with FCC emission standards.
   a. Microprocessor based controller: Part 15, Subpart F, Class A.
   c. Dial-up modems: Part 68

2. 2000 International Fire Code
3. American National Standards Institute (ANSI)
5. International Organization for Standardization (ISO)
6. NEMA: Electrical equipment shall comply with applicable portions of NEMA.
7. Underwriters Laboratories (UL)
   a. UL-1012 and CSA: All power supplies shall be in compliance with Underwriters Laboratories standard UL1012 and CSA standards for power supplies.
   b. UL-294: The system shall comply with Underwriter Laboratories standard UL294 for Access Control Systems.

7. All applicable state and local codes

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination: The ACS contractor is required to coordinate with all required trades work that is required by and for "others".
B. Pre-installation Meetings: Pre-installation meetings shall be held outlining requirements of all trades involved in the successful installation of this ACS.

C. Sequencing: The work shall be performed in the following sequence:

1. Installation of Access Controllers & Modules.
2. Installation of devices and readers.
3. Installation of site control equipment.
4. Commissioning of the new system components.

D. Scheduling: The ACS contractor shall schedule work in order to complete the ACS in accordance with the project timeline.

1.4 ACTION SUBMITTALS

A. Submit evidence of compliance for Security Contractor and equipment manufacturer prior to Bid, and as indicated under the quality assurance section(s) of Division 28 Specification Sections and this section.

B. Submit data consisting of shop drawings and catalog datasheets complete with technical data necessary to evaluate the material and equipment. Include dimension, wiring and block diagrams, performance data, ratings, control sequences, and other descriptive data necessary to describe the item proposed and its operating characteristics. Include a complete technical specification for the submitted equipment, noting differences and adherence to all Division 28 Sections.

C. Submit shop drawings and product data in accordance with Division 1 and this Section.

1. Coordinate with other trades in submittal of shop drawings.
2. Shop drawings shall detail space conditions and shall be subject to final review by the Architect.
3. Provide an operational narrative of each component/system.
4. Submit to Owner a complete listing of proposed devices, indicating interconnection equipment locations and specifying terminal/connector termination locations. Submit a complete set of proposed drawings, identifying equipment locations, types of cabling, numbers of conductors, raceway locations, and termination points of each conductor.
5. The approval of shop drawings or samples does not relieve the Security Contractor of responsibility for any deviation from the requirements of the Contract Documents, unless the Security Contractor has informed the Architect in writing of such deviation at the time of submission, has noted the deviation on the shop drawings, and the Architect has given written approval of the specific deviation. The Architect's approval also does not relieve the Security Contractor from responsibility for errors or omissions in the shop drawings or samples.
6. Coordinate equipment submittals with construction schedules.
7. Do not purchase or install equipment requiring submittal until the review process is complete.
1.5 INFORMATION SUBMITTALS

A. Coordinate with and submit for Owner approval a listing of all system components with recommended labeling for identification within the system.

B. Coordinate with, and Submit for Owner approval a listing of doors recommended for time zone unlocking/alarm shunting.

C. Coordinate with, and Submit for Owner approval, a listing of operator privileges recommended for system segregation.

D. Project Record Documents:
   1. As-Built Drawings: Security Contractor shall maintain record of "as-built" drawings. Upon Security Contractor completion of the final punch list, a full size set of drawings and one set of CAD disks shall be submitted for review and record.
   2. The Security Contractor shall provide documentation of all final components showing the following information.
      a. System Label
      b. Physical Location
      c. System address
      d. Functional description

1.6 CLOSEOUT SUBMITTALS

A. Warranty Documentation: Provide copies of manufacturers' warranties for all system components and applicable equipment. Include statement of labor warranty from the manufacturer, Security Contractor, and/or 3rd party entity.

B. Record Documentation
   1. Submit a copy of a signed agreement between the Security Contractor and the Owner stipulation that the license of all software and operation systems residing on the server and workstations shall become the sole property of the Owner.
   2. Submit to Owner upon completion of Work, all passwords used to access all aspects of the operating system software and database utilized by the ACS. Documentation shall include the name and position of anyone who has knowledge or record of these passwords.

C. Extra Stock Materials: Furnish materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Fuses of all kinds, power and electronic, equal to 10 percent of amount installed for each size used, but no fewer than three units.
D. Substantial Design Closeout Documentation

1. Operation and Maintenance Manual Data: Submit data in accordance with Division 1 and this Section for all equipment specified in this Section. Include complete set of supplier's operating instructions, installation instructions, and troubleshooting guide. Include final listing of doors, locations and normal status.

2. Prior to Substantial Completion, provide schematic drawings depicting type and location of interface equipment/components, number of cables and conductors, raceway locations, types of connectors, circuit requirements and type and dimensions of enclosures.

E. Tools

1. The Security Contractor shall provide documentation of any specialized tools required by the End User in order to perform routine maintenance.

F. Commissioning Reports: Security Contractor shall provide documentation of both the Final Test Acceptance and Start Up Testing as per Part 3, 3.12.

1.7 QUALITY ASSURANCE

A. Qualifications

1. Installer / Systems Integrator Qualifications:
   a. Company must employ workers trained and certified by manufacturer.
   b. Company must have a minimum of 5 (five) years system design, engineering supervision, and installation experience in the alarm or access control industry.
   c. Company must employ personnel that are trained, authorized, and hold current certification to install the specified products.
   d. Company has local coverage for all sites included in this section qualified to service the products being installed.
   e. Service facility: Systems Integrator shall have service facilities within 50 miles of the installation.

2. Testing Agency
   a. Electrical Components, Devices, and Accessories: Must be listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Acceptance: Upon delivery to the site, Contractor shall inspect all products and materials for any damage. Acceptance of the units constitutes that the inspection has occurred and no damaged or unacceptable products were found, and any damage or unacceptable products would be the responsibility of the Contractor.
B. Product Storage and Handling Requirements

1. Central Station, Workstations, and Controllers:
   a. Store in temperature and humidity controlled environment in original manufacturer's sealed containers. Maintain ambient temperature between 50 and 85 deg F (10 and 30 deg C), and not more than 80 percent relative humidity, non-condensing.
   b. Open each container; verify contents against packing list, and file copy of packing list, complete with container identification for inclusion in operation and maintenance data.
   c. Mark packing list with designations that have been assigned to materials and equipment for recording in the system labeling schedules that are generated by cable and asset management system specified in Part 2.
   d. Save original manufacturer's containers and packing materials and deliver as directed under provisions covering extra materials.

1.9 SITE CONDITIONS

A. Ambient Environmental Requirements: System shall be capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:

1. Control Station: Rated for continuous operation in ambient conditions of 60 to 85 deg F (16 to 30 deg C) and a relative humidity of 20 to 80 percent, non-condensing.
2. Interior, Controlled Environment: System components, except central-station control unit, installed in temperature-controlled interior environments shall be rated for continuous operation in ambient conditions of 36 to 122 deg F (2 to 50 deg C) dry bulb and 20 to 90 percent relative humidity, non-condensing. NEMA 250, Type 1 enclosure.
3. Interior, Uncontrolled Environment: System components installed in non-temperature-controlled interior environments shall be rated for continuous operation in ambient conditions of 0 to 122 deg F (minus 18 to plus 50 deg C) dry bulb and 20 to 90 percent relative humidity, non-condensing.
4. Exterior Environment: System components installed in locations exposed to weather shall be rated for continuous operation in ambient conditions of minus 30 to plus 122 deg F (minus 34 to plus 50 deg C) dry bulb and 20 to 90 percent relative humidity, condensing. Rate for continuous operation where exposed to rain as specified in NEMA 250, winds up to 85 mph (137 km/h). NEMA 250.
5. Hazardous Environment: System components located in areas where fire or explosion hazards may exist because of flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers shall be rated, listed, and installed according to NFPA 70.
6. Corrosive Environment: For system components subjected to corrosive fumes, vapors, and wind-driven salt spray in coastal zones, provide NEMA 250.
7. Begin installation of electronic components only when the following is met, in each installation area:
   a. All wet work is completed.
b. Area is dust free.
c. Painting work is completed.

1.10 WARRANTY

A. Special Warranty

1. Proximity Access Readers: Proximity readers shall provide a lifetime warranty against workmanship and defects.
2. System Components: Two (2) year from date of Substantial Completion.
3. Labor: Two (2) year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with project requirements, manufacturers offering Products which shall be incorporated in the Work include the following:

1. Access Control System Hardware/Firmware/Software:
   a. Schlage MT Series card readers
   b. Vanderbilt controllers, door interface boards, power supplies
   c. No Substitutions

2. Power Supplies:
   a. Vanderbilt
   b. No Substitutions

3. Credentials & Readers:
   a. Schlage MT Series readers
   b. No Substitutions

4. Remote Key Switches & Request-to-Exit Buttons:
   a. Schlage Electronic Security
   b. No Substitutions
5. Door Position Switches/Contacts:
   a. Schlage Electronic Security
   b. Approved Equal

6. Request-to-Exit Motion Sensors:
   a. Schlage Electronic Security
   b. Approved Equal

7. Access Control Intercom System
   a. AIPhone JP series with video and door release, master station and substations.

2.2 MATERIALS, GENERAL

A. Power: All ACS equipment shall operate on 120-VAC. Any special power treatment required, such as filtering or spike elimination that maybe required for proper operation and protection of the ACS, shall be provided with the system.

B. Backup Power: ACS equipment shall be supplied from a UPS system, which shall be tied to emergency building power circuits. The UPS shall power the equipment including, but not limited to, access control processors, modules, electronic locks and lock power supplies for a minimum of 4 hours. Access control system PC Servers and Workstations shall be equipped with a local Uninterruptible Power Supply (UPS). The UPS shall provide a minimum of 600VA.

C. Hardware: Provide a distributed access control system as required for a complete operating system as described herein and as shown on the Contract Drawings.

D. Accessories

1. Request-to-Exit Motion Detectors:
   a. Motion detectors shall be used to shunt alarm signals when exiting. Detectors shall not be used to unlock the access door.
   b. 12/24VDC Request-to-Exit (REX) sensors:
      1) Field adjustable for coverage.
      2) Form C relay output for signaling to Controller.

2. Door Position Switches/Contacts:
   a. Hermetically sealed magnetic reed switch.
   b. Contact & magnet housing shall snap-lock into a ½“ hole.
   c. Provide 45-degree condolettes to enclose and protect cabling from door contacts/switches. Condolettes shall be placed as close to the contact/switch as possible.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Site Verification of Conditions

1. Examine pathway elements intended for cables. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation.
2. Examine roughing-in for LAN and control cable conduit systems to PCs, Controllers, card readers, and other cable-connected devices to verify actual locations of conduit and back boxes before device installation.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Furnish any inserts required for building into concrete, masonry, and other work, to support and attach work of this section. Furnish in ample time to comply with schedule of work into which inserts are built.

B. Verify that power and outlets are in correct locations.

C. Verify that building structure is properly prepared for mounting, attachment and support of equipment.

D. Prior to installation of systems components and devices, verify all required preparations have been properly performed and that substrates are acceptable for installation.

1. Verify all rough-ins and field dimensions.

E. Report in writing to the Architect any prevailing conditions that will adversely affect satisfactory execution of Work in this Section.

1. Security Consultant reserves the right to review proposed methods of construction/installation, reject proposed methods, and have the installation done in a satisfactory method at the Contractor's cost.

3.3 INSTALLATION, GENERAL

A. Install work in accordance with manufacturer's recommendations, instructions and final Shop Drawings.

B. Anchor components securely in place, plumb, level, and accurately aligned. Provide separators and isolators to prevent corrosion and electrolytic deterioration.
C. For card readers that are located in equipment traffic areas, and that are exposed to damage due to collision or impact from forklifts, or manually moved carts, carriers, or other equipment used by the Owner, provide protective bollards, railings, coverings etc. to ensure that all card readers installed are properly protected from such damage.

D. Provide fastenings, plates, and other incidental items required for complete and operational installation.

E. Provide required electrical work in accordance with National and Local code requirements.

3.4 WIRING

A. General: Comply with provisions of Section 28 05 13 - Conductors and Cables for Electronic Safety and Security.

B. Install all wiring connecting all system components and controlled and monitored devices.

C. Install all transformers, relays and other accessories.

D. Install all cable, and perform all cable splicing and equipment terminations.

E. Use 45-degree condolettes to enclose and protect cabling from door contacts/switches. Condolettes shall be placed as close to the contact/switch as possible.

F. Pull continuously between connections where possible.

G. Install electronic systems wiring and cabling in conduit or raceway, as noted on Drawings and as specified in Section 28 05 28.

H. Pulling cables and wires:
   1. Do not force or pressure in a manner, which will stretch, break or damage jacket.
   2. Use an inert anti-friction material to assist in pulling wire.
   3. Pull all cables and wires to be installed in a raceway at one time.

3.5 GROUNDING

A. Comply with Division 26 Section "Grounding and Bonding for Electrical Systems."

B. Comply with IEEE 1100, "Power and Grounding Sensitive Electronic Equipment."

C. Ground cable shields, drain conductors, and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

D. Bond shields and drain conductors to ground at only one point in each circuit.
E. Signal Ground:

1. Terminal: Locate in each equipment room and wiring closet; isolate from power system and equipment grounding.
2. Bus: Mount on wall of main equipment room with standoff insulators.
3. Backbone Cable: Extend from signal ground bus to signal ground terminal in each equipment room and wiring closet.

3.6 IDENTIFICATION

A. In addition to requirements in this Article, comply with applicable requirements in Division 26 Section "Identification for Electrical Systems" and with TIA/EIA-606.

B. Using cable and asset management software specified in Part 2, develop Cable Administration Drawings for system identification, testing, and management. Use unique, alphanumeric designation for each cable, and label cable and jacks, connectors, and terminals to which it connects with same designation. Use logical and systematic designations for facility's architectural arrangement.

C. Label each terminal strip and screw terminal in each cabinet, rack, or panel.

D. All wiring conductors connected to terminal strips shall be individually numbered, and each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with the name and number of the particular device as shown.

1. Each wire connected to building-mounted devices is not required to be numbered at the device if the color of the wire is consistent with the associated wire connected and numbered within the panel or cabinet.

3.7 SYSTEM SOFTWARE

A. Install and test software and databases for the complete and proper operation of systems involved. Assign software license to Owner.

3.8 SYSTEM PROGRAMMING

A. The Contractor shall work with the Owner to ensure that the new components will be properly programmed into the existing system.
3.9 SITE QUALITY CONTROL

A. The Contractor shall develop a Final Test and Acceptance (FTA) Plan. The plan shall identify each new system component provided in the work, intent of test, method or methods of test and expected results. Each component listed in the plan shall include space for test part signatures, brief comments, time of test and pass/fail check boxes. The FTA plan shall be submitted to the owner’s representative 30 days prior to the scheduled final test.

B. Provide manufacturer’s supervision of final testing of each system.

1. On-Site Testing: Manufacturer trained and authorized Systems Integrator shall functionally test each component in the system after installation to verify proper operation and confirm that the wiring and dressing conform to the wiring documentation.

C. Each system shall test free from interference, opens, grounds, and short circuits.

D. Start-Up Test (Burn-In)

1. Following completion of the Final Test, the system shall undergo a thirty (30) day Operational Demonstration Test (ODT) or Burn-In period. This operational demonstration period shall start when all specified systems and equipment have been installed and Substantial Completion is reached, with only a moderate number of punch list items remaining.

2. During this period, the system shall be operated under a normal facility traffic load for no less than 30 days. If any item or system fails during the ODT, the 30-day burn-in period shall be suspended for that item until repaired or replaced. Once repaired or replaced, the burn-in period shall recommence.

3. Final system acceptance of the entire project will be withheld until after successful completion of this operational demonstration period for all systems and components.

4. System will not be considered substantially complete until the following activities have been successfully completed:

   a. Acceptance of all submittals.
   b. Delivery of final documentation.
   c. Successful Final Test and Inspection
   d. Successful Operational Demonstration Test
   e. Successful training and demonstration, including operation of systems using the manuals.
   f. Purging of Contractor User privileges and return of all key card media.

3.10 CLEANING AND WASTE MANAGEMENT

A. Cleaning and Touchup: Immediately after installation, including the completion of wiring and testing, clean all work and touchup all damaged factory finishes.
3.11 PROTECTION

A. Maintain strict security during the installation of equipment and software. Rooms housing the control station and workstations that have been powered up shall be locked and secured, with an activated burglar alarm and access-control system reporting to a Central Station complying with UL 1610, Central-Station Burglar-Alarm Units, during periods when a qualified operator in the employ of Contractor is not present.

B. Protection: Provide protective covers, fenders, and barriers as necessary to maintain Work of this Section in same condition as installed until time of Substantial Completion.

3.12 CLOSEOUT ACTIVITIES

A. Demonstration

1. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain security access system. Refer to Division 01 Section Demonstration and Training.

2. Develop separate training modules for the following:
   - Computer system administration personnel to manage and repair the LAN and databases and to update and maintain software.
   - Operators who prepare and input credentials to man the control station and workstations and to enroll personnel.
   - Security personnel.
   - Hardware maintenance personnel.
   - Corporate management.

B. Training

1. Operator Training: Instruct operating staff in proper operation, including hands-on training.
   - Minimum of (2) 2 hours sessions covering the operations for each system installed.
   - Training sessions shall be provided to supervisors, staff, maintenance personnel and any other personnel designated by the Owner. Contractor should prepare to provide operator training for up to ten (10) personnel.

2. Review in detail all information in the Operations and Maintenance Manuals for each system provided.

3. Prior to administering the above training, the Contractor(s) shall prepare an outline of the training, identifying the goals and expectations of the course and detailing what students are expected to learn.

3.13 LIFE CYCLE ACTIVITIES

A. Commissioning: All system components shall be commissioned as to conform to the manufacturer's recommendations for maximum life cycle.
B. Operation and Use: Provide, in writing, Operation and Use procedures for each system component. Such procedures shall be written in order to conform to the manufacturer's recommendations for maximum life cycle.

C. Maintenance: Provide, in writing, Maintenance procedures for each system component. Such procedures shall be written in order to conform to the manufacturer’s recommendations for maximum life cycle.

END OF SECTION 28 13 00