DULUTH TRANSIT AUTHORITY OPERATIONS CENTER OFFICE REMODEL

PROJECT MANUAL

OCTOBER 24, 2022

LHB NO. 190559

CLIENT:

DULUTH TRANSIT AUTHORITY
2402 WEST MICHIGAN STREET
DULUTH, MINNESOTA 55802

TABLE OF CONTENTS

SECTION 00 3100
AVAILABLE PROJECT INFORMATION

PART 1 GENERAL

1.01 EXISTING CONDITIONS

A. Certain information relating to existing surface and subsurface conditions and structures is available to bidders but will not be part of Contract Documents, as follows:

B. Hazardous Material Survey: Entitled Asbestos Test Summary, dated 03-08-2022.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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Report for:

Eric Oleson
American Engineering Testing Inc
550 Cleveland Avenue N.
Saint Paul, MN 55114

Regarding: Project: P-0009881; DTA
EML ID: 2867518

Approved by:

Approved Signatory
Balu Krishnan

Dates of Analysis:
Asbestos PLM: 03-08-2022

Service SOPs: Asbestos PLM (EPA 40CFR App E to Sub E of Part 763 & EPA METHOD 600/R-93-116, SOP EM-AS-S-1267)
NVLAP Lab Code 200844-0

All samples were received in acceptable condition unless noted in the Report Comments portion in the body of the report. The results relate only to the samples as received and tested. The results include an inherent uncertainty of measurement associated with estimating percentages by polarized light microscopy. Measurement uncertainty data for sample results with >1% asbestos concentration can be provided when requested.

Eurofins EMLab P&K
3000 Lincoln Drive East, Suite A, Marlton, NJ 08053
(866) 871-1984 Fax (856) 334-1040 www.emlab.com

Client: American Engineering Testing Inc
C/O: Eric Oleson
Re: P-0009881; DTA

Date of Sampling: 03-03-2022
Date of Receipt: 03-04-2022
Date of Report: 03-08-2022

ASBESTOS PLM REPORT

Total Samples Submitted:	27
Total Samples Analyzed:	27
Total Samples with Layer Asbestos Content > 1%:	4

Location: ASB-1, Carpet Glue Lab ID-Version‡: 13747480-1

Sample Layers	Asbestos Content
Yellow Glue	ND
Sample Composite Homogeneity:	Good

Location: ASB-2, Ceiling tile Lab ID-Version‡: 13747481-1

Sample Layers	Asbestos Content
Gray Ceiling Tile with White Surface	ND
Composite Non-Asbestos Content:	55% Mineral Wool 30% Cellulose
Sample Composite Homogeneity:	Good

Location: ASB-3, Kick plate Lab ID-Version‡: 13747482-1

Sample Layers	Asbestos Content
White Baseboard	ND
Sample Composite Homogeneity:	Good

Location: ASB-4, Ceramic FL tile Lab ID-Version‡: 13747483-1

Sample Layers	Asbestos Content
Tan Ceramic Tile	ND
Sample Composite Homogeneity:	Good

Inhomogeneous samples are separated into homogeneous subsamples and analyzed individually. ND means no fibers were detected. When detected, the minimum detection and reporting limit is less than 1% unless point counting is performed. Floor tile samples may contain large amounts of interference material and it is recommended that the sample be analyzed by gravimetric point count analysis to lower the detection limit and to aid in asbestos identification.
‡ A "Version" indicated by -"x" after the Lab ID# with a value greater than 1 indicates a sample with amended data. The revision number is reflected by the value of "x".

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ASBESTOS PLM REPORT

Location: ASB-5, Kick plate

Lab ID-Version‡: 13747484-1

Sample Layers	Asbestos Content
Brown Ceramic Tile	ND
Sample Composite Homogeneity:	Good

Location: ASB-6, Drywall Joint Tape Compte

Lab ID-Version‡: 13747485-1

Sample Layers	Asbestos Content
Brown Drywall with Brown Paper	ND
White Wallpaper	ND
White Joint Compound	ND
Composite Non-Asbestos Content:	25% Cellulose
Sample Composite Homogeneity:	Good

Location: ASB-7, Ceiling tile

Lab ID-Version‡: 13747486-1

Sample Layers	Asbestos Content
Gray Ceiling Tile	ND
Composite Non-Asbestos Content:	55% Mineral Wool 30% Cellulose
Sample Composite Homogeneity:	Good

Location: ASB-8, Ceramic Kickplate

Lab ID-Version‡: 13747487-1

Sample Layers	Asbestos Content
Brown Ceramic Tile	ND
Black Grout	ND
Sample Composite Homogeneity:	Good

Inhomogeneous samples are separated into homogeneous subsamples and analyzed individually. ND means no fibers were detected. When detected, the minimum detection and reporting limit is less than 1% unless point counting is performed. Floor tile samples may contain large amounts of interference material and it is recommended that the sample be analyzed by gravimetric point count analysis to lower the detection limit and to aid in asbestos identification.
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ASBESTOS PLM REPORT

Location: ASB-9, Carpet Glue

Lab ID-Version‡: 13747488-1

Sample Layers	Asbestos Content
Yellow Glue	ND
Sample Composite Homogeneity:	Good

Location: ASB-10, Drywall Joint Paper

Lab ID-Version‡: 13747489-1

Sample Layers	Asbestos Content
White Drywall with Brown Paper	ND
White Wallpaper	ND
Composite Non-Asbestos Content:	30% Cellulose
Sample Composite Homogeneity:	Good

Location: ASB-11, Kick Plate

Lab ID-Version‡: 13747490-1

Sample Layers	Asbestos Content
Purple Baseboard	ND
Yellow Mastic	ND
Sample Composite Homogeneity:	Good

Location: ASB-12, Ceiling tile

Lab ID-Version‡: 13747491-1

Sample Layers	Asbestos Content
White Ceiling Tile	ND
Composite Non-Asbestos Content:	80% Mineral Wool
Sample Composite Homogeneity:	Good

Inhomogeneous samples are separated into homogeneous subsamples and analyzed individually. ND means no fibers were detected. When detected, the minimum detection and reporting limit is less than 1% unless point counting is performed. Floor tile samples may contain large amounts of interference material and it is recommended that the sample be analyzed by gravimetric point count analysis to lower the detection limit and to aid in asbestos identification.
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ASBESTOS PLM REPORT

Location: ASB-13, 12"x12" Floor tile Lab ID-Version‡: 13747492-1

Sample Layers	Asbestos Content
Tan Floor Tile	ND
Black/Yellow Mastic	3% Chrysotile
Sample Composite Homogeneity:	Good

Location: ASB-14, Ceiling tile Lab ID-Version‡: 13747493-1

Sample Layers	Asbestos Content
White Ceiling Tile with White Surface	ND
Composite Non-Asbestos Content:	90% Mineral Wool
Sample Composite Homogeneity:	Good

Location: ASB-15, Br Kickplate Lab ID-Version‡: 13747494-1

Sample Layers	Asbestos Content
Gray Baseboard	ND
Yellow Mastic	ND
Sample Composite Homogeneity:	Good

Location: ASB-16, 12"x12" floor tile Lab ID-Version‡: 13747495-1

Sample Layers	Asbestos Content
Light Gray Floor Tile	ND
Black Mastic	3% Chrysotile
Sample Composite Homogeneity:	Good

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ASBESTOS PLM REPORT

Location: ASB-17, Ceiling tile

Lab ID-Version‡: 13747496-1

Sample Layers	Asbestos Content
Gray Ceiling Tile with White Surface	ND
Composite Non-Asbestos Content:	50% Cellulose 15% Mineral Wool
Sample Composite Homogeneity:	Good

Location: ASB-18, 12"x12" Red/Br floor tile

Lab ID-Version‡: 13747497-1

Sample Layers	Asbestos Content
Brown Floor Tile	ND
Black Mastic	3% Chrysotile
Sample Composite Homogeneity:	Good

Location: ASB-19, Ceramic flooring

Lab ID-Version‡: 13747498-1

Sample Layers	Asbestos Content
White Ceramic Tile	ND
Gray Grout	ND
Sample Composite Homogeneity:	Good

Location: ASB-20, Kick plate

Lab ID-Version‡: 13747499-1

Sample Layers	Asbestos Content
Black Baseboard	ND
White Mastic	ND
Dark Brown Mastic	ND
Sample Composite Homogeneity:	Good

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ASBESTOS PLM REPORT

Location: ASB-21, Drywall Joint paper Lab ID-Version‡: 13747500-1

Sample Layers	Asbestos Content
Gray Drywall with Brown Paper	ND
White Joint Compound with Paint	ND
Composite Non-Asbestos Content:	10% Cellulose
Sample Composite Homogeneity:	Good

Location: ASB-22, 12"x12" floor tile Lab ID-Version‡: 13747501-1

Sample Layers	Asbestos Content
Cream Floor Tile	ND
Yellow Mastic	ND
Sample Composite Homogeneity:	Good

Location: ASB-23, 12"x12" Brown floor tile Lab ID-Version‡: 13747502-1

Sample Layers	Asbestos Content
Brown Floor Tile	ND
Black Mastic	3% Chrysotile
Sample Composite Homogeneity:	Good

Location: ASB-24, Ceramic tile Lab ID-Version‡: 13747503-1

Sample Layers	Asbestos Content
Off-White Ceramic Tile	ND
Gray Grout	ND
Beige Mortar	ND
Gray Concrete	ND
Sample Composite Homogeneity:	Good

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ASBESTOS PLM REPORT

Location: ASB-25, Ceiling tile Lab ID-Version‡: 13747504-1

Sample Layers	Asbestos Content
Gray Ceiling Tile with White Surface	ND
Composite Non-Asbestos Content:	50% Cellulose 15% Mineral Wool
Sample Composite Homogeneity:	Good

Location: ASB-26, Kick plate Lab ID-Version‡: 13747505-1

Sample Layers	Asbestos Content
Black Baseboard	ND
Brown Mastic	ND
White Joint Compound	ND
Sample Composite Homogeneity:	Good

Location: ASB-27, Drywall Joint Paper Lab ID-Version‡: 13747506-1

Sample Layers	Asbestos Content
White Drywall with Brown Paper	ND
White Joint Compound with Paint	ND
Composite Non-Asbestos Content:	10% Cellulose
Sample Composite Homogeneity:	Good

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SECTION 01 1000
SUMMARY

PART 1 GENERAL

1.01 PROJECT

A. The Project consists of the alteration of public entryway and offfice remodel.

1.02 DESCRIPTION OF ALTERATIONS WORK

A. Scope of alterations work is indicated on drawings.

B. Contractor shall remove and store the following prior to start of work, for later reinstallation by Contractor:
   1. Roller shades where existing exterior windows are removed or modified. Salvaged roller shades are to be modified or matched for new windows..

1.03 OWNER OCCUPANCY

A. Owner intends to continue to occupy adjacent portions of the existing building during the entire construction period.

B. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

C. Schedule the Work to accommodate Owner occupancy.

1.04 CONTRACTOR USE OF SITE AND PREMISES

A. Construction Operations: Limited to areas noted on Drawings.
   1. Locate and conduct construction activities in ways that will limit disturbance to site.

B. Arrange use of site and premises to allow:
   1. Owner occupancy.

C. Provide access to and from site as required by law and by Owner:
   1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
   2. Do not obstruct roadways, sidewalks, or other public ways without permit.

D. Existing building spaces may not be used for storage.

E. Utility Outages and Shutdown:
   1. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to Owner and authorities having jurisdiction.
   2. Prevent accidental disruption of utility services, arranged at least 24 hours in advance with Owner.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2000

PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedures for preparation and submittal of applications for progress payments.

B. Documentation of changes in Contract Sum and Contract Time.

C. Change procedures.

D. Procedures for preparation and submittal of application for final payment.

1.02 SCHEDULE OF VALUES

A. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.

B. Forms filled out by hand will not be accepted.

C. Submit a printed schedule in Electronic Format (PDF) on AIA Form G703 - Application and Certificate for Payment Continuation Sheet. Contractor's standard form or electronic media printout will be considered.

D. Submit Schedule of Values in Electronic Format (PDF) within 10 days after date of Owner-Contractor Agreement.

E. Revise schedule to list approved Change Orders, with each Application For Payment.

1.03 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Period: Submit at intervals stipulated in the Agreement.

B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.

C. Forms filled out by hand will not be accepted.

D. Present required information on electronic media printout.

E. Form: AIA G702 Application and Certificate for Payment and AIA G703 - Continuation Sheet including continuation sheets.

F. Execute certification by signature of authorized officer.

G. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored Products.

H. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of Work.

I. Submit (1) PDF copy of each Application for Payment.

J. Include the following with the application:
   1. Transmittal letter as specified for Submittals in Section 01 3000.

K. When Architect or requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

1.04 MODIFICATION PROCEDURES

A. For minor changes not involving an adjustment to the Contract Price or Contract Time, Architect will issue instructions directly to Contractor.

B. Architect will advise of minor changes in the Work not involving an adjustment to Contract Sum or Contract Time as authorized by the Conditions of the Contract by issuing supplemental instructions on Architect's Standard ASI Format.

C. For other required changes, Architect will issue in Electronic Format (PDF) a Construction Change Directive (CCD) document signed by Owner instructing Contractor to proceed with the change, for subsequent inclusion in a Change Order.
   1. The document will describe the required changes and will designate method of determining any change in Contract Sum or Contract Time.
   2. Promptly execute the change.

D. For changes for which advance pricing is desired, Architect will issue in Electronic Format (PDF) a Proposal Request (PR) that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, an area to indicate a change in Contract Time for executing the change and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within 5 days.

E. Contractor may propose a change by submitting in Electronic Format (PDF) a written request for change to Architect, describing the proposed change and its full effect on the Work, with a statement describing the reason for the change, and the effect on the Contract Sum and Contract Time with full documentation and a statement describing the effect on Work by separate or other contractors. Document any requested substitutions in accordance with Section 01 6000.

F. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
   1. For change requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by Architect.
   2. For change ordered by Architect without a quotation from Contractor, the amount will be determined by Architect based on the Contractor's substantiation of costs as specified for Time and Material work.

G. Substantiation of Costs: Provide full information required for evaluation.
   1. Provide following data:
      a. Quantities of products, labor, and equipment.
      b. Taxes, insurance, and bonds.
      c. Overhead and profit.
      d. Justification for any change in Contract Time.
      e. Credit for deletions from Contract will be at 1/2 the percentage allowed for additions.
      f. Break down of rates for self-performed work, and related overhead and profit associated with this work.
   2. Support each claim for additional costs with additional information:
      a. Origin and date of claim.
      b. Dates and times work was performed, and by whom.
      c. Time records and wage rates paid.
      d. Invoices and receipts for products, equipment, and subcontracts, similarly documented.
   3. For Time and Material work, submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.
   4. Insurance and Bond costs are included in the above Overhead and profit.

H. Execution of Change Orders: Architect will issue Change Orders in Electronic Format (PDF) for signatures of parties as provided in the Conditions of the Contract on AIA A701.

I. After execution of Change Order, promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.

J. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.

K. Promptly enter changes in Project Record Documents.

1.05 APPLICATION FOR FINAL PAYMENT

A. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due.

B. Application for Final Payment will not be considered until the following have been accomplished:
   1. All closeout procedures specified in Section 01 70 00, Section 01 7800.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2500
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedural requirements for proposed substitutions.

1.02 DEFINITIONS

A. Substitutions: Changes from Contract Documents requirements proposed by Contractor to materials, products, assemblies, and equipment.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
   2. Agrees to provide the same warranty for the substitution as for the specified product.
   3. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.
   4. Waives claims for additional costs or time extension that may subsequently become apparent.

B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents. Burden of proof is on proposer.

C. Content: Include information necessary for tracking the status of each Substitution Request, and information necessary to provide an actionable response.

D. Limit each request to a single proposed substitution item.

3.02 SUBSTITUTION PROCEDURES DURING PROCUREMENT

A. Submittal Form (before award of contract):
   1. Submit substitution requests by completing the form attached to this section. See this form for additional information and instructions. Use only this form; other forms of submission are unacceptable.

3.03 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

A. Submittal Form (after award of contract):
   1. Submit substitution requests by completing the form attached to this section. See this section for additional information and instructions. Use only this form; other forms of submission are unacceptable.

B. Submit request for Substitution for Cause 7 discovery of need for substitution, but not later than 14 days prior to time required for review and approval by Architect, in order to stay on approved project schedule.

C. Substitutions will not be considered under one or more of the following circumstances:
   1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
   2. Without a separate written request.
   3. When acceptance will require revisions to Contract Documents.

3.04 RESOLUTION

A. Architect may request additional information and documentation prior to rendering a decision. Provide this data in an expeditious manner.

B. Architect will notify Contractor in writing of decision to accept or reject request.

END OF SECTION

LHB
PERFORMANCE
DRIVEN DESIGN.
LHBcorp.com

Substitution Request

(Incomplete forms will not be processed)

Project Name:	DTA Operations Center Office Remodel	LHB Project No.:	190559
To:	LHB		
Attention:	Julie Samuelson		
Email:	julie.samuelson@lhbcorp.com		
Submitted By:	_____	Date:	_____
Section Number:	_____	Paragraph:	_____

Specified Product: _____

Proposed Product: _____

Reason For Substitution: _____

Description of Proposed Substitution *(Note: Limit this Request to one substitution)*

Manufacturer:	_____	Trade Name:	_____
Model Number:	_____	Contact Person:	_____
		Phone Number:	_____

History: ☐ New Product ☐ 2 to 5 Years Old ☐ 5 to 10 Years Old ☐ More than 10 Years Old

ATTACH COMPLETE TECHNICAL DATA, LITERATURE AND SAMPLE, IF APPLICABLE

A. Does proposed substitution fail to satisfy, in any respect, characteristics specified for original product(s)? ☐ Y ☐ N
B. Does substitution affect dimensions shown on Drawings? ☐ Y ☐ N
C. Does substitution affect other parts of the Work (schedule, warranty, etc.) ☐ Y ☐ N
D. Does substitution affect cost to Owner? ☐ Y ☐ N
   If so, how much? Add $_____ Deduct $_____
E. If you indicated "Yes" to any of the items above, provide the following explanation:
   1. Explain any difference between proposed substitution and specified product.

   2. Summarize experience with product and manufacturer in Project area.

CONTRACTOR'S CERTIFICATION

The undersigned states, proposing this Substitution, certifies the following as true and correct and accepts all conditions relating to this request:

- This Substitution has been fully investigated and determined to be equal or superior in all respects.
- The same warranty will be furnished.
- The same maintenance service and source of replacement parts, as applicable, is available.
- The change to the Construction Progress Schedule is unchanged.
- The cost data as stated above is complete. All claims for any additional costs related to this Substitution does not affect dimensions or functional clearances.
- The Substitution does not affect dimensions or functional clearances.
- All Architectural/Engineering design fees associated with the review, evaluation, and or design and detailing changes as a result of this Substitution Request are the responsibility of the Contractor. The amount of these fees will be deducted from the Contract Sum due to the Contractor.
- Coordination, installation, and changes to the Work as necessary for an accepted Substitution will be complete in all respects.

Submitted By: _____

Signature: _____

Firm: _____

Address: _____

Telephone: _____

FOR USE BY ARCHITECT/ENGINEER

☐ Substitution Recommended: Make submittals in accordance with Specifications.
☐ Substitution Recommended as Noted: Make submittals in accordance with Specifications.
☐ Substitution Rejection Recommended: Use specified products. Architect shall not be held responsible for the performance of any substitution accepted or approved by Owner over the recommendation of the Architect (Release and Indemnification Agreement between Owner and Architect required).
☐ Substitution Request received after deadline: Use specified products.
☐ Substitution Request returned: Incomplete submittal, use specified products.

Comments:

Signature: _____ Date: _____

NOTE: If approved, LHB will include product approval in Addendum

SECTION 01 3000
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electronic document submittal service.

B. Preconstruction meeting.

C. Progress meetings.

D. Submittals for review, information, and project closeout.

E. Requests for Interpretation (RFI) procedures.

F. Submittal procedures.

1.02 PROJECT COORDINATION

A. Project Coordinator: General Contractor.

B. Cooperate with the Owner and Architect in allocation of mobilization areas of site; for field offices and sheds, for access, for traffic, and for parking facilities.

C. During construction, coordinate use of site and facilities through the Project Coordinator.

D. Comply with Project Coordinator's procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.

E. Comply with instructions of the Project Coordinator for use of temporary utilities and construction facilities.

F. Coordinate field engineering and layout work under instructions of the Project Coordinator.

G. Make the following types of submittals to Architect through the Project Coordinator:
   1. Requests for interpretation.
   2. Requests for substitution.
   3. Shop drawings, product data, and samples.
   4. Test and inspection reports.
   5. Design data.
   6. Manufacturer's instructions and field reports.
   7. Applications for payment and change order requests.
   8. Progress schedules.
   9. Coordination drawings.
   10. Correction Punch List and Final Correction Punch List for Substantial Completion.
   11. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 ELECTRONIC DOCUMENT SUBMITTAL SERVICE

A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF) format and transferred via e-mail to the Architect.
   1. Besides submittals for review, information, and closeout, this procedure applies to Requests for Information (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, Contractor's correction punchlist, and any other document any participant wishes to make part of the project record.
   2. Contractor and Architect and Owner are required to follow this protocol.
   3. Users of the service need an email address, Internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat,

www.adobe.com, or Bluebeam PDF Revu, www.bluebeam.com), unless such software capability is provided by the service provider.

4. Paper document transmittals will not be reviewed. It is the Contractors responsibility to submit documents in PDF format.
5. All other specified submittal and document transmission procedures apply, physical samples or color selection charts shall be submitted in PDF format in addition to submission of physical sample to the Architect.

B. Architect's Submittal Service: The selected service is:
   1. Newforma Project Center

3.02 PRECONSTRUCTION MEETING

A. Architect will schedule a meeting after Notice of Award.

B. Attendance Required at Preconstruction Meeting:
   1. Owner.
   2. Construction Manager
   3. Architect.
   4. Contractor.
   5. All primary subcontractors.

C. Agenda:
   1. Execution of Owner-Contractor Agreement.
   2. Submission of executed bonds and insurance certificates.
   3. Review of Electronic Document Submittal Service requirements.
   4. Submission of list of Subcontractors, list of Products, schedule of values, and progress schedule.
   5. Designation of personnel representing the parties to Contract, Contractor and Architect.
   6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
   7. Scheduling.
   8. Site mobilization, administrative requirements, Owner requirements.
   9. Review requirements for indoor air quality management plan and construction waste management disposal.

D. Contractor will record minutes and distribute via e-mail within three (3) business days after meeting. Distribution to subcontractors is the responsibility of the Contractor.

3.03 PROGRESS MEETINGS

A. Project Coordinator will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

B. Attendance Required:
   1. Contractor.
   2. Owner.
   3. Architect.
   4. Contractor's Superintendent.
   5. Major Subcontractors.

C. Agenda:
   1. Review minutes of previous meetings.
   2. Review of Work progress.
   3. Field observations, problems, and decisions.
   4. Identification of problems that impede, or will impede, planned progress.
   5. Review of submittals schedule and status of submittals.
   6. Review of off-site fabrication and delivery schedules.
   7. Maintenance of progress schedule.
   8. Corrective measures to regain projected schedules.
   9. Planned progress during succeeding work period.

10. Coordination of projected progress.
11. Maintenance of quality and work standards.
12. Effect of proposed changes on progress schedule and coordination.
13. Other business relating to Work.

D. Architect will record minutes and post them to Internet-based submittal service within five business days after meeting. Distribution to subcontractors without access to submittal service shall be the responsibility of the Contractor.

3.04 CONSTRUCTION PROGRESS SCHEDULE

A. Within 5 days after date of the Agreement, submit preliminary schedule defining planned operations for the first 60 days of Work, with a general outline for remainder of Work.

B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.

C. Within 5 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
   1. Include written certification that major contractors have reviewed and accepted proposed schedule.
   2. Indicate critical path items.

D. Within 5 days after joint review, submit complete schedule.

E. Submit updated schedule at every progress meeting.

F. Submit updated schedule with each Application for Payment.

3.05 REQUESTS FOR INTERPRETATION (RFI)

A. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of the Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.
   1. Prepare a separate RFI for each specific item.
      a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.
      b. Do not forward requests which solely require internal coordination between subcontractors.
   2. Combine RFI and its attachments into a single electronic file. PDF format is preferred.

B. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.
   1. Unacceptable Uses for RFIs: Do not use RFIs to request the following::
      a. Approval of submittals (use procedures specified elsewhere in this section).
      b. Approval of substitutions (see Section - 01 6000 - Product Requirements)
      c. Changes that entail change in Contract Time and Contract Sum (comply with provisions of the Conditions of the Contract).
   2. Frivolous RFIs: Requests regarding information that is clearly indicated on, or reasonably inferable from, the Contract Documents, with no additional input required to clarify the question. They will be returned without a response, with an explanatory notation.

C. Content: Include identifiers necessary for tracking the status of each RFI, and information necessary to provide an actionable response.
   1. Discrete and consecutive RFI number, and descriptive subject/title.
   2. Issue date, and requested reply date.
   3. Reference to particular Contract Document(s) requiring additional information/interpretation. Identify pertinent drawing and detail number and/or specification section number, title, and paragraph(s).
   4. Annotations: Field dimensions and/or description of conditions which have engendered the request.
   5. Contractor's suggested resolution: A written and/or a graphic solution, to scale, is required in cases where clarification of coordination issues is involved, for example; routing, clearances, and/or specific locations of work shown diagrammatically in Contract

Documents. If applicable, state the likely impact of the suggested resolution on Contract Time or the Contract Sum.

D. Attachments: Include sketches, coordination drawings, descriptions, photos, submittals, and other information necessary to substantiate the reason for the request.

E. Review Time: Architect will respond and return RFIs to Contractor within five calendar days of receipt. For the purpose of establishing the start of the mandated response period, RFIs received after 3:00 PM will be considered as having been received on the following regular working day.

F. Responses: Content of answered RFIs will not constitute in any manner a directive or authorization to perform extra work or delay the project. If in Contractor's belief it is likely to lead to a change to Contract Sum or Contract Time, promptly issue a notice to this effect, and follow up with an appropriate Change Order Request to Owner.

3.06 SUBMITTAL SCHEDULE

A. Submit to Architect for review a schedule for submittals in tabular format.
   1. Format schedule to allow tracking of status of submittals throughout duration of construction.
   2. Account for time required for preparation, review, manufacturing, fabrication and delivery when establishing submittal delivery and review deadline dates.
      a. For assemblies, equipment, systems comprised of multiple components and/or requiring detailed coordination with other work, allow for additional time to make corrections or revisions to initial submittals, and time for their review.

3.07 SUBMITTAL SCHEDULE

A. Provide preliminary submittal schedule within 10 days of award of contract. Provide revised final submittal schedule within 20 days of award of contract.

3.08 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them in internet-based submittal service for review:
   1. Product data.
   2. Shop drawings.
   3. Warranty.
   4. Calculations.
   5. Schedules.
   6. Templates.

B. Provide quantity and size of physical samples as specified in individual sections. Also, scan and submit them in internet-based submittal service for submittal review processing:
   1. Samples for selection.
   2. Samples for verification.
   3. Maintenance materials.
   4. Cost breakdowns.

C. Submit to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.

D. Samples will be reviewed only for aesthetic, color, or finish selection.

3.09 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them in internet-based submittal service for information:
   1. Design data.
   2. Certificates.
   3. Test reports.
   4. Inspection reports.
   5. Manufacturer's instructions.

6. Manufacturer's field reports.
7. Other types indicated.

B. Submit for Architect's knowledge as contract administrator or for Owner.

3.10 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit Correction Punch List for Substantial Completion.

B. Submit Final Correction Punch List for Substantial Completion.

C. When the following are specified in individual sections, submit them in internet-based submittal service at project closeout:
1. Project record documents.
2. Operation and maintenance data.
3. Warranties.
4. Bonds.
5. Other types as indicated.

D. Submit for Owner's benefit as specified in Section 01 7000.

3.11 NUMBER OF COPIES OF SUBMITTALS

A. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
1. Samples shall be sent in PDF format in addition to the physical sample.
2. Retained samples will not be returned to Contractor unless specifically so stated.

3.12 SUBMITTAL PROCEDURES

A. General Requirements:
1. Use a separate transmittal for each item.
2. Submit separate packages of submittals for review, when included in the same specification section.
3. Transmittal and submittal shall be combined into a single PDF. Do not send transmittal separate from the submittal.
4. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
5. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
6. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of products required, field dimensions, adjacent construction work, and coordination of information is in accordance with the requirements of the work and Contract Documents.
   a. Submittals from sources other than the Contractor, or without Contractor's stamp will not be acknowledged, reviewed, or returned.
7. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
8. Provide space for Contractor and Architect review stamps.
9. When revised for resubmission, identify all changes made since previous submission.
10. Incomplete submittals will not be reviewed, unless they are partial submittals for distinct portion(s) of the work, and have received prior approval for their use.

B. Product Data Procedures:
1. Submit only information required by individual specification sections.
2. Collect required information into a single submittal.
3. Do not submit (Material) Safety Data Sheets for materials or products.
4. Submit sustainable design reporting submittals where indicated in specification sections.

C. Shop Drawing Procedures:
1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting the Contract Documents and coordinating related Work.

2. Generic, non-project specific information submitted as shop drawings do not meet the requirements for shop drawings.

D. Transmit each submittal with a copy of approved submittal form.

E. Contractor shall ensure that they are able send and receive large file size (ie. 50 MB) documents electronically.

F. Schedule submittals to expedite the Project, and coordinate submission of related items.

G. Transmit each submittal with approved form. Reference Specification Section Number and description of submittal on each transmittal.

H. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.

I. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy.

J. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents. Submittals without the Contractor's stamp will not be reviewed by the Architect/Engineer.

K. Schedule submittals in internet-based submittal service to expedite the Project, and coordinate submission of related items.

L. For each submittal for review, allow 14 calendar days for review at Architect/Engineer's office.

M. Identify variations from Contract Documents and Product or system limitations that may be detrimental to successful performance of the completed Work.

N. Provide space for Contractor and Architect review stamps.

O. When revised for resubmission, identify all changes made since previous submission.

P. Re-submittals beyond one will result in additional services by the Architect/Engineer and a deduct change in the contract amount to cover the cost of services.

Q. Distribute reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.

R. Submittals not requested will not be recognized or processed.

3.13 ELECTRONIC (AUTOCAD) DRAWING FILES

A. Architect will provide contractors with electronic drawing files, .DWG format of plan views only, upon the following conditions:
   1. Architect obtains approval from Owner.
   2. Architect Limited License Agreement prepared and signed by Architect and contractor.
   3. Electronic drawing files will be provided in .DWG format. Contractor assumes the responsibility and the risk of conversion into another format.

END OF SECTION

SECTION 01 4000
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Submittals.

B. References and standards.

C. Control of installation.

D. Tolerances.

E. Testing and inspection agencies and services.

F. Control of installation.

G. Tolerances.

H. Manufacturers' field services.

I. Defect Assessment.

1.02 REFERENCE STANDARDS

A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2008 (Reapproved 2014).

B. ASTM C1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation; 2014.

C. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry; 2013.

D. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection and/or Testing; 2014a.

E. ASTM E 548 - Standard Guide for General Criteria used for Evaluating Laboratory Competence; 1994.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Test Reports: After each test/inspection, promptly submit Email copies of report to Architect, Contractor and Building Official.
   1. Include:
      a. Date issued.
      b. Project title and number.
      c. Name of inspector.
      d. Date and time of sampling or inspection.
      e. Identification of product and specifications section.
      f. Location in the Project.
      g. Type of test/inspection.
      h. Date of test/inspection.
      i. Results of test/inspection.
      j. Conformance with Contract Documents.
      k. When requested by Architect, provide interpretation of results.

C. Certificates: When specified, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
   1. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
   2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.

D. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

E. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
   1. Submit report in duplicate within 30 days of observation to Architect for information.
   2. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

1.04 REFERENCES AND STANDARDS

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

C. Obtain copies of standards where required by product specification sections.

D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.

E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.05 TESTING AND INSPECTION AGENCIES AND SERVICES

A. Owner will employ services of an independent testing agency (TA) to perform specified quality control testing and inspection. Additionally, the Owner will provide and pay for the following testing and inspection services:
   1. SI-T, Special Inspector - Technical.
   2. SI-S, Special Inspector - Structural.
   3. SER, Structural Engineer of Record.

B. Contractor shall employ and pay for services of an independent testing agency to perform other additional quality control testing, for testing above and beyond that is listed here to ensure quality control such that the Contractor shall take responsibility for the end product.

C. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

D. Contractor Employed Agency:
   1. Testing agency: Comply with requirements of ASTM E 329, ASTM E 543, ASTM C 1021, ASTM C 1077, and ASTM C 1093, and shall be pre-approved by the Architect / Engineer.
   2. Laboratory: Authorized to operate in State in which Project is located.
   3. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.
   4. Testing Equipment: Calibrated at reasonable intervals either by NIST or using an NIST established Measurement Assurance Program, under a laboratory measurement quality assurance program.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have Work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

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

3.02 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

3.03 TESTING AND INSPECTION

A. See individual specification sections and Special Structural Testing and Inspection Program Summary Schedule following this section for quality control testing and inspection required.

B. Testing Agency Duties:
   1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
   2. Perform specified sampling and testing of products in accordance with specified standards.
   3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
   4. Promptly notify Architect and Contractor of observed irregularities or non-conformance of Work or products.
   5. Perform additional tests and inspections required by Architect.
   6. Submit reports of all tests/inspections specified within 7 days. Notify Architect / Engineer within 24 hours of any failed tests or non-conformities.

C. Limits on Testing/Inspection Agency Authority:
   1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
   2. Agency may not approve or accept any portion of the Work.
   3. Agency may not assume any duties of Contractor.
   4. Agency has no authority to stop the Work.

D. Contractor Responsibilities:
   1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
   2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.

3. Provide incidental labor and facilities:
    a. To provide direct access to Work to be tested/inspected.
    b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
    c. To facilitate tests/inspections.
    d. To provide storage and curing of test samples.
4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

E. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect. Payment for re-testing will be charged to the Contractor by deducting testing charges from the Contract Price.

3.04 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.

B. Submit qualifications of observer to Architect 30 days in advance of required observations.
    1. Observer subject to approval of Architect.

C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.05 DEFECT ASSESSMENT

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

END OF SECTION

SECTION 01 5000

TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary Controls: Barriers, enclosures, and fencing.

B. Security requirements.

C. Waste removal facilities and services.

1.02 FENCING

A. Construction: Contractor's option.

B. Provide 6 foot high fence around construction storage and staging area in parking lot to secure property; equip with vehicular gates with locks.

1.03 VEHICULAR ACCESS AND PARKING

A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.

B. Coordinate access and haul routes with governing authorities and Owner.

C. Provide and maintain access to fire hydrants, free of obstructions.

D. Do not allow vehicle parking on existing pavement.

1.04 WASTE REMOVAL

A. See Section 01 7419 - Construction Waste Management and Disposal, for additional requirements.

B. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

C. Provide containers with lids. Remove trash from site periodically.

1.05 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.

B. Clean and repair damage caused by installation or use of temporary work.

C. Restore existing facilities used during construction to original condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 6000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Re-use of existing products.

B. Transportation, handling, storage and protection.

C. Product option requirements.

D. Substitution limitations and procedures.

E. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 REFERENCE STANDARDS

A. 16 CFR 260.13 - Guides for the Use of Environmental Marketing Claims; Federal Trade Commission; Recycled Content; Current Edition.

1.03 SUBMITTALS

A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
   1. Submit within 15 days after date of Agreement.
   2. For products specified only by reference standards, list applicable reference standards.

B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

C. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

D. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
   1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

E. Indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

1.04 QUALITY ASSURANCE

A. Composite Wood and Agrifiber: Products made of wood particles and/or plant material pressed and bonded with adhesive or resin such as particleboard, medium density fiberboard (MDF), plywood, wheatboard, strawboard, panel substrates, and door cores.

B. Recycled Content: Determine percentage of post-consumer and pre-consumer (post-industrial) content separately, using the guidelines contained in 16 CFR 260.13.
   1. Previously used, reused, refurbished, and salvaged products are not considered recycled.
   2. Wood fabricated from timber abandoned in transit to original mill is considered reused, not recycled.
   3. Determine percentage of recycled content of any item by dividing the weight of recycled content in the item by the total weight of materials in the item.
   4. Acceptable Evidence:
      a. For percentage of recycled content, information from manufacturer.

C. Reused Products: Materials and equipment previously used in this or other construction, salvaged and refurbished as specified.
   1. Wood fabricated from timber abandoned in transit after harvesting is considered reused, not recycled.
   2. Acceptable Evidence: Information about the origin or source, from Contractor or supplier.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by the Contract Documents.

B. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.

C. Reused Products: Reused products include materials and equipment previously used in this or other construction, salvaged and refurbished as specified.

D. Specific Products to be Reused: The reuse of certain materials and equipment already existing on the project site is required.
   1. See Section 01 1000 for list of items required to be salvaged for reuse and relocation.

2.02 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by the Contract Documents.

B. DO NOT USE products having any of the following characteristics:
   1. Made outside the United States, its territories, Canada, or Mexico.
   2. Made using or containing CFC's or HCFC's.
   3. Made of wood from newly cut old growth timber.
   4. Containing lead, cadmium, asbestos.

C. Where all other criteria are met, Contractor shall give preference to products that:
   1. If used on interior, have lower emissions, as defined in Section 01 6116.
   2. If wet-applied, have lower VOC content, as defined in Section 01 6116.
   3. Are extracted, harvested, and/or manufactured closer to the location of the project.
   4. Have longer documented life span under normal use.
   5. Result in less construction waste.
   6. Are made of recycled materials.

2.03 PRODUCT OPTIONS

A. Where proprietary names are used in these specifications, it is understood that they are followed by the words “or equal.”

B. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.

C. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, or of another manufacturer with an "equal" product meeting the standards or description.

D. Manufacturer and/or Product Substitutions: Submit a request for substitution for any manufacturer and/or product not named in these specifications 10 days prior to bidding.

2.04 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

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

PART 3 EXECUTION

3.01 SUBSTITUTION PROCEDURES

A. See Section 01 2500 - Substitution Procedures.

B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.

C. A request for substitution constitutes a representation that the submitter:

1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
2. Agrees to provide the same warranty for the substitution as for the specified product.
3. Agrees to coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
4. Waives claims for additional costs or time extension that may subsequently become apparent.
5. Agrees to reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.

D. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals.

E. Substitution Submittal Procedure (Prior to Bidding):
1. **Complete LHB Substitution Request Form** (attached) whenever a substitution is requested. All questions on the form must be answered. Requests with incomplete forms will not be processed.
2. Submit Email copies of request for substitution for consideration on the LHB form attached to this section. Limit each request to one proposed substitution.
3. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
4. The Architect will notify by addendum of decision to accept or reject request.
5. All products to be used must have approval prior to bidding.

F. Contractor and Owner shall take responsibility for any substitution performed after Bidding.

3.02 OWNER-SUPPLIED PRODUCTS

A. See Section 01 1000 for identification of Owner-supplied products.

B. Owner's Responsibilities:
1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
2. Arrange and pay for product delivery to site.
3. On delivery, inspect products jointly with Contractor.
4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
5. Arrange for manufacturers' warranties, inspections, and service.

C. Contractor's Responsibilities:
1. Review Owner reviewed shop drawings, product data, and samples.
2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
3. Handle, store, install and finish products.
4. Repair or replace items damaged after receipt.

3.03 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. Transport and handle products in accordance with manufacturer's instructions.

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.04 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.

B. Store and protect products in accordance with manufacturers' instructions.

C. Store with seals and labels intact and legible.

D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.

E. For exterior storage of fabricated products, place on sloped supports above ground.

F. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.
   1. Execute a formal supplemental agreement between Owner and Contractor allowing off-site storage, for each occurrence.

G. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

H. Comply with manufacturer's warranty conditions, if any.

I. Do not store products directly on the ground.

J. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

K. Prevent contact with material that may cause corrosion, discoloration, or staining.

L. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

M. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 01 6116

VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Requirements for VOC-Content-Restricted products.

1.02 DEFINITIONS

A. VOC-Content-Restricted Products: All products in the following product categories, whether specified or not:
   1. Interior paints and coatings applied on site.
   2. Interior adhesives and sealants applied on site, including flooring adhesives.

B. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.

C. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.

1.03 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board; 2007.

C. SCAQMD 1113 - Architectural Coatings; 1977 (Amended 2016).

D. SCAQMD 1168 - Adhesive and Sealant Applications; 1989 (Amended 2017).

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Sustainable Design Reporting: Submit evidence of compliance.

PART 2 PRODUCTS

2.01 MATERIALS

A. All Products: Comply with the most stringent of federal, State, and local requirements, or these specifications.

B. Indoor-Emissions-Restricted Products: Comply with Indoor Emissions Standard and Test Method, except for:
   1. Composite Wood, Wood Fiber, and Wood Chip Products: Comply with Composite Wood Emissions Standard or contain no added formaldehyde resins.

C. VOC-Content-Restricted Products: VOC content not greater than required by the following:
   1. Adhesives, Including Flooring Adhesives: SCAQMD 1168 Rule.
   2. Joint Sealants: SCAQMD 1168 Rule.
   3. Paints and Coatings: Each color; most stringent of the following:
      a. 40 CFR 59, Subpart D.
      b. SCAQMD 1113 Rule.
      c. CARB (SCM).

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

A. Owner reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to Owner.

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

END OF SECTION

SECTION 01 7000

EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Requirements for alterations work, including selective demolition, except removal and disposal.

C. Cutting and patching.

D. Cleaning and protection.

E. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

1.02 RELATED REQUIREMENTS

A. Section 01 1000 - Summary.

B. Section 07 8400 - Firestopping.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
   1. Structural integrity of any element of Project.
   2. Efficiency, maintenance, or safety of any operational element.
   3. Visual qualities of sight exposed elements.

C. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.04 PROJECT CONDITIONS

A. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

B. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
   1. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Owner.

C. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
   1. Indoors: Limit conduct of especially noisy interior work to 8 am to 5 pm.

1.05 COORDINATION

A. See Section 01 1000 for occupancy-related requirements.

B. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

C. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

D. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

E. Coordinate completion and clean-up of work of separate sections.

F. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

E. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 GENERAL INSTALLATION REQUIREMENTS

A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.04 ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as indicated.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of alterations work constitutes acceptance of existing conditions.

B. Keep areas in which alterations are being conducted separated from other areas that are still occupied.

C. Remove existing work as indicated and as required to accomplish new work.
   1. Remove items indicated on drawings.
   2. Relocate items indicated on drawings.
   3. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
   4. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.

D. Services (Including but not limited to HVAC, Plumbing, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
   2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
   3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
      a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
      b. See Section 01 1000 for other limitations on outages and required notifications.
      c. Provide temporary connections as required to maintain existing systems in service.
   4. Verify that abandoned services serve only abandoned facilities.
   5. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.

E. Protect existing work to remain.
   1. Prevent movement of structure; provide shoring and bracing if necessary.
   2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.

F. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
   1. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect.
   2. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.
   3. Where a change of plane of 1/4 inch or more occurs in existing work, submit recommendation for providing a smooth transition for Architect review and request instructions.

G. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.

H. Clean existing systems and equipment.

I. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.

J. Do not begin new construction in alterations areas before demolition is complete.

K. Comply with all other applicable requirements of this section.

3.05 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. See Alterations article above for additional requirements.

C. Perform whatever cutting and patching is necessary to:
   1. Complete the work.
   2. Fit products together to integrate with other work.
   3. Provide openings for penetration of mechanical, electrical, and other services.
   4. Match work that has been cut to adjacent work.
   5. Repair areas adjacent to cuts to required condition.
   6. Repair new work damaged by subsequent work.
   7. Remove samples of installed work for testing when requested.
   8. Remove and replace defective and non-complying work.

D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

E. Restore work with new products in accordance with requirements of Contract Documents.

F. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

G. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material , to full thickness of the penetrated element.

H. Patching:
   1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
   2. Match color, texture, and appearance.
   3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.06 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.07 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

3.08 ADJUSTING

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

3.09 FINAL CLEANING

A. Execute final cleaning prior to Substantial Completion.
   1. Clean areas to be occupied by Owner prior to final completion before Owner occupancy.

B. Use cleaning materials that are nonhazardous.

C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

D. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.10 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.

B. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.

C. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.

D. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.

E. Owner will occupy all of the building as specified in Section 01 1000.

F. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.

G. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.

H. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.

I. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

END OF SECTION

SECTION 01 7419

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

A. Owner requires that this project generate the least amount of trash and waste possible.

B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.

C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.

D. Required Recycling, Salvage, and Reuse: The following may not be disposed of in landfills or by incineration:
   1. Aluminum and plastic beverage containers.
   2. Corrugated cardboard.
   3. Wood pallets.
   4. Clean dimensional wood.
   5. Concrete: May be crushed and used as riprap, aggregate, sub-base material, or fill.
   6. Concrete masonry units: May be used on project if whole, or crushed and used as sub-base material or fill.
   7. Metals, including packaging banding, metal studs, sheet metal, structural steel, piping, reinforcing bars, door frames, and other items made of steel, iron, galvanized steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
   8. Glass.

E. Contractor shall submit periodic Waste Disposal Reports; all landfill disposal, recycling, salvage, and reuse must be reported regardless of to whom the cost or savings accrues; use the same units of measure on all reports.

F. Contractor shall develop and follow a Waste Management Plan designed to implement these requirements.

G. Methods of trash/waste disposal that are not acceptable are:
   1. Burning on the project site.
   2. Burying on the project site.
   3. Dumping or burying on other property, public or private.
   4. Other illegal dumping or burying.
   5. Incineration, either on- or off-site.

H. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 DEFINITIONS

A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.

B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.

C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.

D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.

E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

I. Return: To give back reusable items or unused products to vendors for credit.

J. Reuse: To reuse a construction waste material in some manner on the project site.

K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.

L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.

M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

N. Toxic: Poisonous to humans either immediately or after a long period of exposure.

O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Waste Management Plan: Include the following information:
   1. Analysis of the trash and waste projected to be generated during the entire project construction cycle, including types and quantities.
   2. Landfill Options: The name, address, and telephone number of the landfill(s) where trash/waste will be disposed of, the applicable landfill tipping fee(s), and the projected cost of disposing of all project trash/waste in the landfill(s).
   3. Landfill Alternatives: List all waste materials that will be diverted from landfills by reuse, salvage, or recycling.
   4. Meetings: Describe regular meetings to be held to address waste prevention, reduction, recycling, salvage, reuse, and disposal.
   5. Materials Handling Procedures: Describe the means by which materials to be diverted from landfills will be protected from contamination and prepared for acceptance by designated facilities; include separation procedures for recyclables, storage, and packaging.
   6. Transportation: Identify the destination and means of transportation of materials to be recycled; i.e. whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler.

C. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.
   1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
   2. Submit Report on a form acceptable to Owner.
   3. Landfill Disposal: Include the following information:
      a. Identification of material.
      b. Amount, in tons or cubic yards, of trash/waste material from the project disposed of in landfills.

c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.

4. Recycled and Salvaged Materials: Include the following information for each:
   a. Identification of material, including those retrieved by installer for use on other projects.
   b. Amount, in tons or cubic yards, date removed from the project site, and receiving party.
   c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.
   d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
   e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.
5. Material Reused on Project: Include the following information for each:
   a. Identification of material and how it was used in the project.
   b. Amount, in tons or cubic yards.
   c. Include weight tickets as evidence of quantity.
6. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 WASTE MANAGEMENT PROCEDURES

A. See Section 01 1000 for list of items to be salvaged from the existing building for relocation in project or for Owner.

B. See Section 01 3000 for additional requirements for project meetings, reports, submittal procedures, and project documentation.

C. See Section 01 5000 for additional requirements related to trash/waste collection and removal facilities and services.

D. See Section 01 6000 for waste prevention requirements related to delivery, storage, and handling.

E. See Section 01 7000 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

3.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.

C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

D. Meetings: Discuss trash/waste management goals and issues at project meetings.
   1. Prebid meeting.
   2. Preconstruction meeting.
   3. Regular job-site meetings.

E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.

1. Provide containers as required.
2. Provide adequate space for pick-up and delivery and convenience to subcontractors.
3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.

I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION

SECTION 01 7800
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Punch List.

B. Operation and Maintenance Data.

C. Warranties and bonds.

D. Forms Required at Project Closeout

1.02 SUBMITTALS

A. Upon Substantial Completion, conduct Contractor Punchlist and submit to Architect for use/review per AIA A201 General Conditions of the Contract.

B. Project Record Documents: Submit documents to Architect two-weeks prior to claim for final Application for Payment.

C. Operation and Maintenance Data:
   1. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
   2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
   3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
   4. Submit two sets of revised final documents in final form within 10 days after final inspection.

D. Warranties and Bonds:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within 10 days after acceptance.
   2. Make other submittals within 10 days after Date of Substantial Completion, prior to final Application for Payment.
   3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within 10 days after acceptance, listing the date of acceptance as the beginning of the warranty period.

E. Forms Required:
   1. Prior to final payment, Contractor must submit a complete "Contractor's Affidavit" for Sole Proprietor or Partnership/Corporation on the form attached at the end of this section.
   2. Prior to final payment, Contractor must submit a complete "Consent of Surety to Final Payment" on the form attached at the end of this section.
   3. Prior to final payment, Contractor must submit a complete "IC-134 Withholding Affidavit for Contractors" or Exemption from Surety for Non-Minnesota Contractors SE-E" on attached forms attached at the end of this section as required by the Minnesota Department of Revenue.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Specifications.
   3. Addenda.

4. Change Orders and other modifications to the Contract.
5. Reviewed shop drawings, product data, and samples.
6. Manufacturer's instruction for assembly, installation, and adjusting.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress.

E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
1. Changes made by Addenda and modifications.

F. Record Drawings and Shop Drawings: Mark each item to record actual construction including:
1. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
2. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
3. Field changes of dimension and detail.
4. Details not on original Contract drawings.

3.02 OPERATION AND MAINTENANCE DATA

A. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

B. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

C. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.

D. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

3.03 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:
1. Product data, with catalog number, size, composition, and color and texture designations.

B. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.

C. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.

D. Additional information as specified in individual product specification sections.

E. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

3.04 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:
1. Description of unit or system, and component parts.
2. Identify function, normal operating characteristics, and limiting conditions.
3. Include performance curves, with engineering data and tests.
4. Complete nomenclature and model number of replaceable parts.

B. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.

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

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

E. Provide servicing and lubrication schedule, and list of lubricants required.

F. Include manufacturer's printed operation and maintenance instructions.

G. Include sequence of operation by controls manufacturer.

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

I. Provide control diagrams by controls manufacturer as installed.

J. Include test and balancing reports.

K. Additional Requirements: As specified in individual product specification sections.

3.05 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

A. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

B. Where systems involve more than one specification section, provide separate tabbed divider for each system.

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

D. Prepare data in the form of an instructional manual.

E. Binders: Commercial quality, 8-1/2 by 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

F. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.

G. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants,Contractorand subcontractors, with names of responsible parties.

H. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.

I. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.

J. Text: Manufacturer's printed data, or typewritten data on 24 pound paper.

K. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

L. Arrange content by systems under section numbers and sequence of Table of Contents of this Project Manual.

M. Contents: Prepare a Table of Contents for each volume, with each product or system description identified, in three parts as follows:

1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect, Contractor, Subcontractors, and major equipment suppliers.
2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
    a. Significant design criteria.
    b. List of equipment.
    c. Parts list for each component.
    d. Operating instructions.
    e. Maintenance instructions for equipment and systems.
    f. Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
3. Part 3: Project documents and certificates, including the following:
    a. Shop drawings and product data.
    b. Air and water balance reports.
    c. Certificates.
    d. Photocopies of warranties and bonds.

N. Provide a listing in Table of Contents for design data, with tabbed dividers and space for insertion of data.

O. Table of Contents: Provide title of Project; names, addresses, and telephone numbers of Architect, Consultants, and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.

3.06 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

E. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.

F. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.

G. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.

H. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

3.07 LOOSE PARTS

A. Provide loose parts for equipment provided for Project including, but not limited, the following:
1. Loose parts for mechanical equipment.
2. Adjustment wrenches and hardware.
3. Keys for door hardware, accessories, and other products.

3.08 EXTRA STOCK MATERIALS

A. Unless otherwise specified, submit to the Owner the following minimum quantities of materials:

1. Floor Tile: One unopened case of each type.
2. Wall Tile: One unopened case of each type.
3. Ceiling Tile: One unopened case of each type.
4. Paint: Two unopened gallons of each type and color.

3.09 JOB CLOSEOUT AND DOCUMENT TURNOVER

A. Construction Documents CD's, Owner and Operation Manuals (O&M's), As-Builts, Specifications and other documents turned over at the completion of the projects shall be furnished to the Owner in both paper hard copy and digital PDF.
   1. Construction Documents
      a. PDF Creation: Each roll of drawings shall be scanned or converted to PDF to one single PDF document.
         1) Scanning:
            (a) 200 DPI Grayscale
            (b) Cropped to original size
            (c) Color corrected and despeckled
      b. Bookmarking: Each page of the PDF shall be bookmarked with the number and name of the sheet.
      c. Naming: The PDF shall be labeled: "Building Name_Year_Title_Spec_Type"
         1) Name = Building Name
         2) Year = Date of Documents
         3) Title = "Addition" "Remodel," etc...
         4) CD = Construction Document
         5) Type = Arch, Mech, Electrical Communications or a combination of the above
   2. Specifications
      a. PDF Creation: Each book of specifications shall be scanned or converted to PDF to one single PDF document.
         1) Scanning:
            (a) 200 DPI Grayscale
      b. Bookmarking: Not required.
      c. Naming: The PDF shall be labeled: "Building Name_Year_Title_Spec_Type"
      d. Name = Building Name
      e. Year = Date of Documents
      f. Title = "Addition" "Remodel," etc...
      g. CD = Construction Document
      h. Type = Arch, Mech, Electrical Communications or a combination of the above
   3. Owners and Operation Manuals
      a. O&M's shall be turned over by the Contractor.
      b. PDF Creation: Each book of specifications shall be scanned or converted to PDF to one single PDF document.
         1) Scanning:
            (a) 200 DPI Grayscale
      c. Bookmarking: Bookmarking of O&M Manuals shall be extensive

END OF SECTION

SECTION 06 4100

ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Countertops.

B. Hardware.

1.02 RELATED REQUIREMENTS

A. Section 12 3600 - Countertops.

1.03 REFERENCE STANDARDS

A. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2017, with Errata (2019).

B. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
   1. Scale of Drawings: 1-1/2 inch to 1 foot, minimum.
   2. Include certification program label.

C. Product Data: Provide data for hardware accessories.

D. Verification sample: Submit one 4" x 6" actual sample of each plastic laminate specified.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect units from moisture damage.

1.07 FIELD CONDITIONS

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

PART 2 PRODUCTS

2.01 CABINETS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

2.02 WOOD-BASED COMPONENTS

A. Wood fabricated from old growth timber is not permitted.

2.03 LAMINATE MATERIALS

A. Manufacturers:
   1. Formica Corporation; Standard HPL: www.formica.com/#sle.
   2. Panolam Industries International, Inc; Nevamar Standard HPL: www.panolam.com/#sle.
   3. Panolam Industries International, Inc; Pionite Standard HPL: www.panolam.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.

C. Provide specific types as indicated.

1. Post-Formed Horizontal Surfaces: HGP, 0.039 inch nominal thickness, colors as indicated, finish as indicated.
2. Post-Formed Vertical Surfaces: VGP, 0.028 inch nominal thickness, colors as indicated, finish as indicated.
3. Laminate Backer: BKL, 0.020 inch nominal thickness, undecorated; for application to concealed backside of panels faced with high pressure decorative laminate.

2.04 COUNTERTOPS

A. Solid Surface countertops are specified in Section 12 3600.

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

2.05 ACCESSORIES

A. Adhesive: Type recommended by fabricator to suit application.

B. Fasteners: Size and type to suit application.

C. Grommets: Standard painted metal or rubber grommets for cut-outs, in color to match adjacent surface.

2.06 HARDWARE

A. Fixed Specialty Workstation and Countertop Brackets: ADA compliant, heavy duty.
   1. Material: Steel.
   2. Finish: Manufacturer's standard, factory-applied powder coat.
   3. Color: Selected by Architect from manufacturer's standard range.
   4. Manufacturers:
      a. A&M Hardware, Inc; Heavy-Duty Hybrid Brackets: http://www.aandmhardware.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.07 FABRICATION

A. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify location and sizes of utility rough-in associated with work of this section.

3.02 INSTALLATION

A. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.

B. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.

C. Cut countertop for field installed grommets above power/data outlets underneath.

3.03 ADJUSTING

A. Adjust installed work.

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

3.04 CLEANING

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

END OF SECTION

SECTION 06 6110
SOLID POLYMER FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Countertops.

1.02 REFERENCES

A. ASTM D 570 - Standard Test Method for Water Absorption of Plastics; 1998.

B. ASTM D 696 - Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30 degrees C and 30 degrees C With a Vitreous Silica Dilatometer; 1998.

C. ASTM D 790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials; 2000.

D. ASTM D 2583; Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.

E. ASTM D 6110; Standard Test Method for Determining the Charpy Impact Resistance of Notched Specimens of Plastics

F. NEMA LD 3 - High Pressure Decorative Laminates; 1995.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Indicate product description, fabrication information, and compliance with specified performance requirements.

C. Shop Drawings: Indicate dimensions, component sizes, fabrication details, attachment provisions, and coordination requirements with adjacent work.

D. Maintenance Data: Submit manufacturer's care and maintenance data, including repair and cleaning instructions. Include in project closeout documents.

1.04 QUALITY ASSURANCE

A. Fabricator/Installer Qualifications: Approved by manufacturer of solid polymer manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver no components to project site until areas are ready for installation. Store components indoors prior to installation.

B. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation for duration of project.

PART 2 PRODUCTS

2.01 MATERIALS

A. Solid Polymer Material: Homogeneous filled acrylic meeting ANSI Z124.3 and Z124.6, Type Six, and FS WW-P-541E/GEN (1); not coated, laminated, or of composite construction.
   1. Color: Basis of Design.
      a. Corian, color Fossil.
   2. Tensile Strength: 2300 psi minimum, when tested in accordance with ASTM D 638.
   3. Tensile Modulus: 1000000 psi minimum, when tested in accordance with ASTM D 638.
   4. Flexural Modulus: 1000000 psi minimum, when tested in accordance with ASTM D 790.
   5. Color Stability: No change, 100 hours minimum, when tested in accordance with ANSI Z124.6-1997 5.1.
   6. Impact Resistance: Notched Izod: 0.21 foot-pounds minimum, when tested in accordance with ASTM D 256, Method A.
   7. Stain Resistance: Passing ANSI Z124.6 1997 5.2 tests.

8. Fungi and Bacteria: No attack, when tested in accordance with ASTM G 21 and G 22.

B. Joint Adhesive: Manufacturer's standard two-part adhesive kit to create inconspicuous, nonporous joints, with chemical bond.

C. Panel Adhesive: Manufacturer's standard neoprene-based panel adhesive meeting ANSI A136.1, UL listed.

D. Sealant: Manufacturer's standard mildew-resistant, FDA/UL recognized silicone sealant in color-matching or clear formulations.

E. Cleaner: Type recommended by manufacturer.

2.02 SOLID POLYMER FABRICATIONS

A. Countertops: Solid polymer material; adhesively joined with inconspicuous seams, edge details as shown on drawings.
   1. Material Thickness: 1/2 inch, unless noted otherwise in drawings.

2.03 SOLID POLYMER FABRICATION

A. Fabricate components in shop to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and solid polymer manufacturer requirements.

B. Rout and finish component edges to a smooth, uniform finish. Rout all cutouts, then sand all edges smooth. Repair or eject defective or inaccurate work.

C. Finish: Uniform on all surfaces.
   1. Matte: Gloss rating of 5-20.

D. Thermoforming: Comply with forming data from manufacturer.
   1. Construct matching molds of plywood to form component shape.
   2. Form pieces to shape prior to seaming and joining.
   3. Cut pieces larger than finished dimensions. Sand edges; remove all nicks and scratches.
   4. Heat entire component uniformly prior to forming.
   5. Prevent blistering, whitening, and cracking of solid polymer material during forming.

E. Recess and conceal fasteners, connections, and reinforcing.

2.04 SOURCE QUALITY CONTROL

A. Allowable Tolerances:
   1. Variation in Component Size: Plus or minus 1/8 inch.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions where installation of Plastic Fabrications will occur, with Installer present, for compliance with manufacturer’s requirements. Verify that substrates and conditions are satisfactory for installation and comply with requirements specified.

3.02 INSTALLATION

A. Install components plumb and level, in accordance with approved shop drawings and product installation details.

B. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work. Keep components and hands clean when making joints.

C. Keep components and hands clean during installation. Remove adhesives, sealants, and other stains. Components shall be clean on Date of Substantial Completion.

D. Protect surfaces from damage until Date of Substantial Completion. Repair or replace damaged work that cannot be repaired to architect's satisfaction and invoice for the cost of repairs; before repairs are made, cost estimates are subject to architect's approval.

END OF SECTION

SECTION 07 2100
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Board insulation at exterior wall behind exterior wall finish.

B. Batt insulation for filling perimeter window and door shim spaces.

1.02 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

1.03 REFERENCE STANDARDS

A. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2019.

B. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2017.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2020.

D. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C; 2019a.

E. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components; 2019.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

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

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Insulation Over Metal Stud Framed Walls, Continuous: Extruded polystyrene (XPS) board.

B. Insulation on Inside of Concrete and Masonry Exterior Walls: Glass fiber board.

C. Insulation in Metal Framed Walls: Batt insulation with no vapor retarder.

2.02 FOAM BOARD INSULATION MATERIALS

A. Extruded Polystyrene (XPS) Board Insulation: Complies with ASTM C578 with either natural skin or cut cell surfaces.
   1. Type and Compressive Resistance: Type IV, 25 psi (173 kPa), minimum.
   2. Flame Spread Index (FSI): Class A - 0 to 25, when tested in accordance with ASTM E84.
   3. Smoke Developed Index (SDI): 450 or less, when tested in accordance with ASTM E84.
   4. Type and Thermal Resistance, R-value: Type IV, 5.0 (0.88) per 1 inch thickness at 75 degrees F mean temperature.
   5. Complies with fire resistance requirements specified as part of an exterior non-load-bearing exterior wall assembly when tested in accordance with NFPA 285.
   6. Type and Water Absorption: Type IV, 0.3 percent by volume, maximum, by total immersion.
   7. Manufacturers:
      a. Kingspan Insulation LLC; GreenGuard XPS Type IV, 25 psi: www.kingspan.com/#sle.
      b. Owens Corning Corporation; FOAMULAR Extruded Polystyrene (XPS) Insulation: www.ocbuildingspec.com/#sle.
      c. Substitutions: See Section 01 6000 - Product Requirements.

2.03 BATT INSULATION MATERIALS

A. Where batt insulation is indicated, either glass fiber or mineral fiber batt insulation may be used, at Contractor's option.

B. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.
   1. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.

C. Mineral Fiber Batt Insulation: Flexible or semi-rigid preformed batt or blanket, complying with ASTM C665; friction fit; unfaced flame spread index of 0 (zero) when tested in accordance with ASTM E84.
   1. Smoke Developed Index: 0 (zero), when tested in accordance with ASTM E84.

2.04 ACCESSORIES

A. Adhesive: Type recommended by insulation manufacturer for application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 BATT INSTALLATION

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

B. Install in exterior wall spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

3.04 PROTECTION

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

END OF SECTION

SECTION 07 9200
JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Joint backings and accessories.

1.02 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions: Additional requirements for sealants and primers.

1.03 REFERENCE STANDARDS

A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer; 2015.

B. ASTM C834 - Standard Specification for Latex Sealants; 2017.

C. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2018.

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

E. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.

F. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2018.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.
   1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
   2. List of backing materials approved for use with the specific product.
   3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
   4. Substrates the product should not be used on.

C. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

1.05 QUALITY ASSURANCE

A. Maintain one copy of each referenced document covering installation requirements on site.

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

C. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Non-Sag Sealants: Permits application in joints on vertical surfaces without sagging or slumping.
   1. ADFAST Corporation: www.adfastcorp.com/#sle.
   2. Adhesives Technology Corporation: www.atcepoxy.com/#sle.
   3. Bostik Inc: www.bostik-us.com/#sle.
   4. Dow Chemical Company: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
   5. Hilti, Inc: www.us.hilti.com/#sle.

6. Master Builders Solutions by BASF: www.master-builders-solutions.basf.us/en-us/#sle.
7. Momentive Performance Materials, Inc (formerly GE Silicones): www.momentive.com/#sle.
8. Pecora Corporation: www.pecora.com/#sle.
9. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
10. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com/#sle.
11. W.R. Meadows, Inc: www.wrmeadows.com/#sle.
12. Substitutions: See Section 01 6000 - Product Requirements.

2.02 JOINT SEALANT APPLICATIONS

A. Scope:
   1. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
      a. Joints between door, window, and other frames and adjacent construction.
      b. In sound-rated wall and ceiling assemblies, gaps at electrical outlets, wiring devices, piping, and other openings; between wall/ceiling and other construction; and other flanking sound paths.
      c. Other joints indicated below.
   2. Do not seal the following types of joints.
      a. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
      b. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
      c. Joints where installation of sealant is specified in another section.
      d. Joints between suspended panel ceilings/grid and walls.

B. Interior Joints: Use non-sag polyurethane sealant, unless otherwise indicated.
   1. Wall and Ceiling Joints in Non-Wet Areas: Acrylic emulsion latex sealant.
   2. In Sound-Rated Assemblies: Acrylic emulsion latex sealant.

C. Sound-Rated Assemblies: Walls and ceilings identified as "STC-rated", "sound-rated", or "acoustical".

2.03 JOINT SEALANTS - GENERAL

A. Sealants and Primers: Provide products with levels of volatile organic compound (VOC) content as indicated in Section 01 6116.

2.04 NONSAG JOINT SEALANTS

A. Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus 25 percent, minimum.
   2. Non-Staining To Porous Stone: Non-staining to light-colored natural stone when tested in accordance with ASTM C1248.
   3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
   4. Color: Match adjacent finished surfaces.

B. Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic.
   1. Color: White.
   2. Manufacturers:
      a. ADFAST Corporation; ADSEAL KB 4800 Series: www.adfastcorp.com/#sle.
      b. Everkem Diversified Products, Inc; TruSil 100: www.everkemproducts.com/#sle.
      c. Pecora Corporation; Pecora 898 NST (Non-Staining Technology): www.pecora.com/#sle.
      d. Sika Corporation; Sikasil GP: www.usa-sika.com/#sle.

e. Substitutions: See Section 01 6000 - Product Requirements.

C. Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; not expected to withstand continuous water immersion or traffic.
   1. Movement Capability: Plus and minus 25 percent, minimum.
   2. Color: Match adjacent finished surfaces.

D. Non-Sag "Traffic-Grade" Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; single or multi-component; explicitly approved by manufacturer for continuous water immersion and traffic without the necessity to recess sealant below traffic surface.
   1. Movement Capability: Plus and minus 25 percent, minimum.
   2. Hardness Range: 40 to 50, Shore A, when tested in accordance with ASTM C661.
   3. Color: Match adjacent finished surfaces.

E. Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging; not intended for exterior use.

2.05 ACCESSORIES

A. Backer Rod: Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.

B. Backing Tape: Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

C. Masking Tape: Self-adhesive, nonabsorbent, non-staining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.

D. Joint Cleaner: Non-corrosive and non-staining type, type recommended by sealant manufacturer; compatible with joint forming materials.

E. Primers: Type recommended by sealant manufacturer to suit application; non-staining.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.03 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform installation in accordance with ASTM C1193.

C. Perform acoustical sealant application work in accordance with ASTM C919.

D. Install bond breaker backing tape where backer rod cannot be used.

E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

F. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

G. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

3.04 FIELD QUALITY CONTROL

A. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.

B. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

3.05 POST-OCCUPANCY

A. Post-Occupancy Inspection: Perform visual inspection of entire length of project sealant joints at a time that joints have opened to their greatest width; i.e. at low temperature in thermal cycle. Report failures immediately and repair.

END OF SECTION

SECTION 08 1113

HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-fire-rated hollow metal doors and frames.

B. Hollow metal frames for wood doors.

C. Hollow metal borrowed lites glazing frames.

1.02 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2011.

C. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames; 2003 (R2009).

D. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2017.

E. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2011.

F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2019a.

G. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2018.

H. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2018a.

I. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2015a.

J. ASTM C476 - Standard Specification for Grout for Masonry; 2019.

K. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames; 2016.

L. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

M. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.

N. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.

O. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2007.

P. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2014.

Q. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2013.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

D. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.

1.04 QUALITY ASSURANCE

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

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hollow Metal Doors and Frames:
   1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com/#sle.
   2. Curries, an Assa Abloy Group company: www.assaabloydss.com/#sle.
   3. Fleming Door Products, an Assa Abloy Group company: www.assaabloydss.com/#sle.
   4. Republic Doors, an Allegion brand: www.republicdoor.com/#sle.
   5. Steelcraft, an Allegion brand: www.allegion.com/#sle.
   6. Substitutions: See Section 01 6000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Doors and Frames:
   1. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
   2. Accessibility: Comply with ICC A117.1 and ADA Standards.
   3. Door Edge Profile: Manufacturers standard for application indicated.
   4. Typical Door Face Sheets: Flush.
   5. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturers standard.
   6. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Hollow Metal Panels: Same construction, performance, and finish as doors.

C. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.03 HOLLOW METAL DOORS

A. Door Finish: Factory primed and field finished.

B. Interior Doors, Non-Fire-Rated:
   1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
      a. Level 2 - Heavy-duty.
      b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.

c. Model 1 - Full Flush.
d. Door Face Metal Thickness: 18 gage, 0.042 inch, minimum.

2. Door Thickness: 1-3/4 inches, nominal.

2.04 HOLLOW METAL FRAMES

A. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

B. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.
1. Terminated Stops: Provide at interior doors; closed end stop terminated 6 inch, maximum, above floor at 45 degree angle.
2. Frame Metal Thickness: 18 gage, 0.042 inch, minimum.
3. Frame Finish: Factory primed and field finished.

C. Frames for Wood Doors: Comply with frame requirements in accordance with corresponding door.

D. Borrowed Lites Glazing Frames: Construction and face dimensions to match door frames, and as indicated on drawings.

2.05 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

2.06 ACCESSORIES

A. Glazing: As specified in Section 08 8000, factory installed.

B. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.

C. Grout for Frames: Mortar grout complying with ASTM C476 with maximum slump of 4 inches as measured in accordance with ASTM C143/C143M for hand troweling in place; plaster grout and thinner pumpable grout are prohibited.

D. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

E. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.

B. Coordinate frame anchor placement with wall construction.

C. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.

D. Install door hardware as specified in Section 08 7100.
1. Comply with recommended practice for hardware placement of doors and frames in accordance with ANSI/SDI A250.6 or NAAMM HMMA 861.

E. Comply with glazing installation requirements of Section 08 8000.

F. Touch up damaged factory finishes.

3.03 TOLERANCES

A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.

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

3.04 ADJUSTING

A. Adjust for smooth and balanced door movement.

B. Adjust sound control doors so that seals are fully engaged when door is closed.

C. Test sound control doors for force to close, latch, and unlatch; adjust as necessary in compliance with requirements.

3.05 SCHEDULE

A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

SECTION 08 1416
FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flush wood doors; flush and flush glazed configuration; non-rated.

1.02 RELATED REQUIREMENTS

A. Section 08 1213 - Hollow Metal Frames.

B. Section 08 7100 - Door Hardware.

1.03 REFERENCE STANDARDS

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2018).

B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.1; 2017, with Errata (2019).

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.

C. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.

D. Samples: Submit two samples of door veneer, 2 by 2 inches in size illustrating wood grain, stain color, and sheen.

E. Manufacturer's Qualification Statement.

F. Installer's Qualification Statement.

G. Warranty, executed in Owner's name.

1.05 QUALITY ASSURANCE

A. Maintain one copy of the specified door quality standard on site for review during installation and finishing.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than three years of documented experience.

1. Company with at least one project within past five years with value of woodwork within at least 20 percent of cost of woodwork for this project.

C. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Package, deliver and store doors in accordance with specified quality standard.

B. Accept doors on site in manufacturer's packaging, and inspect for damage.

C. Protect doors with resilient packaging sealed with heat shrunk plastic; do not store in damp or wet areas or areas where sunlight might bleach veneer; seal top and bottom edges with tinted sealer if stored more than one week, and break seal on site to permit ventilation.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Interior Doors: Provide manufacturer's warranty for the life of the installation.

C. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Wood Veneer Faced Doors:
   1. Krieger Specialty Products: www.kriegerproducts.com/#sle.
   2. Masonite Architectural: www.architectural.masonite.com/#sle.
   3. Oregon Door: www.oregondoor.com/#sle.
   4. VT Industries, Inc: www.vtindustries.com/#sle.
   5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 DOORS

A. Doors: See drawings for locations and additional requirements.
   1. Quality Standard: Custom Grade, Heavy Duty performance, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
   2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.

B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
   1. Provide solid core doors at each location.
   2. Wood veneer facing with factory transparent finish as indicated on drawings.

2.03 DOOR AND PANEL CORES

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

2.04 DOOR FACINGS

A. Veneer Facing for Transparent Finish: Maple, veneer grade in accordance with quality standard indicated, plain sliced (flat cut), with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.

2.05 DOOR CONSTRUCTION

A. Fabricate doors in accordance with door quality standard specified.

B. Cores Constructed with stiles and rails:

C. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.

D. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.

E. Provide edge clearances in accordance with the quality standard specified.

2.06 FINISHES - WOOD VENEER DOORS

A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
   1. Transparent:
      a. Stain Color: To match existing.
      b. Sheen: Standard.

B. Factory finish doors in accordance with approved sample.

2.07 ACCESSORIES

A. Glazing: See Section 08 8000.

B. Glazing Stops: Wood, of same species as door facing, butted corners; prepared for countersink style tamper proof screws.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and specified quality standard.

B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.

C. Use machine tools to cut or drill for hardware.

D. Coordinate installation of doors with installation of frames and hardware.

E. Coordinate installation of glazing.

3.03 TOLERANCES

A. Comply with specified quality standard for fit and clearance tolerances.

B. Comply with specified quality standard for telegraphing, warp, and squareness.

3.04 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

3.05 SCHEDULE

A. Refer to drawings

END OF SECTION

SECTION 08 4313

ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed storefront, with vision glass.

B. Aluminum doors and frames.

1.02 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants: Sealing joints between frames and adjacent construction.

B. Section 08 7100 - Door Hardware: Hardware items other than specified in this section.

C. Section 08 8000 - Glazing: Glass and glazing accessories.

1.03 REFERENCE STANDARDS

A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; 2015.

B. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document); 2015.

C. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).

D. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021.

E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

F. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2013.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

B. Preinstallation Meeting: Conduct a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, door hardware, and internal drainage details.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.

D. Samples: Submit two samples 2 by 2 inches in size illustrating finished aluminum surface, glass, infill panels, glazing materials.

E. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.

F. Design Data: Provide framing member structural and physical characteristics, engineering calculations, and dimensional limitations.

G. Manufacturer's qualification statement.

H. Installer's qualification statement.

I. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.08 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

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

C. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

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

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Aluminum-Framed Storefronts Manufacturers:
   1. Kawneer North America: www.kawneer.com/#sle.
   2. Oldcastle BuildingEnvelope: www.oldcastlebe.com/#sle.
   3. Tubelite, Inc: www.tubeliteinc.com/#sle.
   4. Trulite Glass & Aluminum Solutions, LLC: www.trulite.com/#sle.
   5. Substitutions: See Section 01 6000 - Product Requirements.

2.02 STOREFRONT

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
   1. Glazing Position: Centered (front to back).
   2. Vertical Mullion Dimensions: 2 inches wide by 4-1/2 inches deep.
   3. Finish: Class I color anodized.
      a. Factory finish all surfaces that will be exposed in completed assemblies.
   4. Finish Color: As selected by Architect from manufacturer's standard line.
   5. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
   6. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
   7. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
   8. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.

9. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
10. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
11. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glazing and inner sheet of infill panel and heel bead of glazing compound.

2.03 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, drainage holes and internal weep drainage system.
   1. Framing members for interior applications need not be thermally broken.
   2. Glazing Stops: Flush.

B. Glazing: As specified in Section 08 8000.

C. Swing Doors: Glazed aluminum.
   1. Thickness: 1-3/4 inches.
   2. Top Rail: 4 inches wide.
   3. Vertical Stiles: 4-1/2 inches wide.
   4. Bottom Rail: 6 inches wide.
   5. Glazing Stops: Square.
   6. Finish: Same as storefront.

2.04 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Sheet Aluminum: ASTM B209/B209M.

C. Fasteners: Stainless steel.

D. Concealed Flashings: Galvanized steel, 26 gage, 0.0179 inch minimum base metal thickness.

E. Concealed Flashings: Stainless steel, 26 gage, 0.0187 inch minimum thickness.

F. Sill Flashing Sealant: Elastomeric, silicone or polyurethane, compatible with flashing material.

G. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

H. Glazing Accessories: As specified in Section 08 8000.

2.05 FINISHES

A. Class I Color Anodized Finish: AAMA 611 AA-M12C22A42 Integrally colored anodic coating not less than 0.7 mils thick.

B. Color: Match Existing.

2.06 HARDWARE

A. Other Door Hardware: As specified in Section 08 7100.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

3.02 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

G. Install glass and infill panels in accordance with Section 08 8000, using glazing method required to achieve performance criteria.

H. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.03 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inch per 3 feet non-cumulative or 0.06 inch per 10 feet, whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.04 ADJUSTING

A. Adjust operating hardware and sash for smooth operation.

3.05 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Upon completion of installation, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.

3.06 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION

SECTION 08 7100
DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Hardware for wood and aluminum doors.

B. Electrically operated and controlled hardware.

C. Weatherstripping and gasketing.

1.02 RELATED REQUIREMENTS

A. Section 08 1113 - Hollow Metal Doors and Frames.

B. Section 08 1416 - Flush Wood Doors.

C. Section 08 4313 - Aluminum-Framed Storefronts: Door hardware, except as noted in section.

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. BHMA A156.1 - American National Standard for Butts and Hinges; 2016.

C. BHMA A156.2 - American National Standard for Bored and Preassembled Locks & Latches; 2017.

D. BHMA A156.3 - American National Standard for Exit Devices; 2014.

E. BHMA A156.4 - American National Standard for Door Controls - Closers; 2013.

F. BHMA A156.6 - American National Standard for Architectural Door Trim; 2015.

G. BHMA A156.7 - American National Standard for Template Hinge Dimensions; 2016.

H. BHMA A156.13 - American National Standard for Mortise Locks & Latches Series 1000; 2017.

I. BHMA A156.16 - American National Standard for Auxiliary Hardware; 2018.

J. BHMA A156.18 - American National Standard for Materials and Finishes; 2016.

K. BHMA A156.21 - American National Standard for Thresholds; 2014.

L. BHMA A156.22 - American National Standard for Door Gasketing and Edge Seal Systems Sponsor; 2017.

M. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

N. UL (DIR) - Online Certifications Directory; Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.

B. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.

C. Keying Requirements Meeting:
   1. Owner will schedule meeting at project site prior to Contractor occupancy.
   2. Attendance Required:
      a. Contractor.
      b. Owner.
   3. Agenda:
      a. Establish keying requirements.
      b. Verify locksets and locking hardware are functionally correct for project requirements.
   4. Incorporate "Keying Requirements Meeting" decisions into keying submittal upon review of door hardware keying system including, but not limited to, the following:
   5. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

6. Deliver established keying requirements to manufacturers.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.

C. Shop Drawings - Door Hardware Schedule: Submit detailed listing that includes each item of hardware to be installed on each door. Use door numbering scheme as included in Contract Documents.
   1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
   2. Provide complete description for each door listed.
   3. Provide manufacturer's and product names, and catalog numbers; include functions, types, styles, sizes and finishes of each item.
   4. Include account of abbreviations and symbols used in schedule.

D. Keying Schedule:
   1. Submit three (3) copies of Keying Schedule in compliance with requirements established during Keying Requirements Meeting unless otherwise indicated.

1.06 QUALITY ASSURANCE

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

B. Installer Qualifications: Company specializing in performing work of the type specified for commercial door hardware with at least three years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

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

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Warranty against defects in material and workmanship for period indicated, from Date of Substantial Completion.
   1. Locksets and Cylinders: Three years, minimum.
   2. Other Hardware: Two years, minimum.

PART 2 PRODUCTS

2.01 DESIGN AND PERFORMANCE CRITERIA

A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.

B. Provide individual items of single type, of same model, and by same manufacturer.

C. Provide door hardware products that comply with the following requirements:
   1. Applicable provisions of federal, state, and local codes.
   2. Accessibility: ADA Standards and ICC A117.1.

D. Fasteners:
   1. Provide fasteners of proper type, size, quantity, and finish that comply with commercially recognized standards for proposed applications.
      a. Aluminum fasteners are not permitted.
      b. Provide phillips flat-head screws with heads finished to match door surface hardware unless otherwise indicated.

2.02 HINGES

A. Manufacturers:
   1. McKinney; an Assa Abloy Group company: www.assaabloydss.com/#sle.

2. Bommer Industries, Inc: www.bommer.com/#sle.
3. C. R. Laurence Co., Inc: www.crl-arch.com/#sle.
4. Hager Companies: www.hagerco.com/#sle.
5. Stanley, dormakaba Group: www.stanleyhardwarefordoors.com/#sle.
6. Substitutions: See Section 01 6000 - Product Requirements.

B. Hinges: Comply with BHMA A156.1, Grade 1.
1. Butt Hinges: Comply with BHMA A156.1 and BHMA A156.7 for templated hinges.
a. Provide hinge width required to clear surrounding trim.
2. Provide hinges on every swinging door.
3. Provide five-knuckle full mortise butt hinges unless otherwise indicated.
4. Provide ball-bearing hinges at each door with closer.
5. Provide non-removable pins on exterior outswinging doors.
6. Provide power transfer hinges where electrified hardware is mounted in door leaf.
7. Provide following quantity of butt hinges for each door:
a. Doors up to 60 inches High: Two hinges.
b. Doors From 60 inches High up to 90 inches High: Three hinges.

2.03 EXIT DEVICES

A. Manufacturers:
1. Corbin Russwin, Sargent, or Yale; an Assa Abloy Group company: www.assaabloydss.com/#sle.
2. C. R. Laurence Company, Inc: www.crl-arch.com/#sle.
3. DORMA USA, Inc: www.dorma.com/#sle.
4. Hager Companies: www.hagerco.com/#sle.
5. Stanley, dormakaba Group: www.stanleyhardwarefordoors.com/#sle.
6. Von Duprin, an Allegion brand: www.allegion.com/us/#sle.
7. Substitutions: See Section 01 6000 - Product Requirements.

B. Exit Devices: Comply with BHMA A156.3, Grade 1.
1. Lever design to match lockset trim.
2. Provide cylinder with cylinder dogging or locking trim.
3. Provide exit devices properly sized for door width and height.
4. Provide strike as recommended by manufacturer for application indicated.
5. Provide UL (DIR) listed exit device assemblies for fire-rated doors and panic device assemblies for non-fire-rated doors.
6. For electrical options, provide quick connect plug-in pre-wired connectors.

2.04 ELECTRIC STRIKES

A. Under separate contract. Coordinate with Owner.

2.05 LOCK CYLINDERS

A. Lock Cylinders: Provide key access on outside of each lock, unless otherwise indicated.
1. Provide cylinders from same manufacturer as locking device.
2. Provide cams and/or tailpieces as required for locking devices.

2.06 CYLINDRICAL LOCKS

A. Cylindrical Locks (Bored): Comply with BHMA A156.2, Grade 1, 4000 Series.
1. Bored Hole: 2-1/8 inch diameter.
2. Latchbolt Throw: 1/2 inch, minimum.
3. Backset: 2-3/4 inch unless otherwise indicated.
4. Strikes: Provide manufacturer's standard strike for each latchset or lockset with strike box and curved lip extending to protect frame in compliance with indicated requirements.
a. Finish: To match lock or latch.
5. Provide a lock for each door, unless otherwise indicated that lock is not required.

2.07 MORTISE LOCKS

A. Manufacturers:
   1. Corbin Russwin, Sargent, or Yale; an Assa Abloy Group company: www.assaabloydss.com/#sle.
   2. Best, dormakaba Group: www.bestaccess.com/#sle.
   3. DORMA USA, Inc; M9000 Series: www.dorma.com/#sle.
   4. Hager Companies: www.hagerco.com/#sle.

B. Mortise Locks: Comply with BHMA A156.13, Grade 1, Security, 1000 Series.
   1. Latchbolt Throw: 3/4 inch, minimum.
   2. Deadbolt Throw: 1 inch, minimum.
   3. Backset: 2-3/4 inch unless otherwise indicated.
   4. Strikes: Provide manufacturer's standard strike for each latchset or lockset with strike box and curved lip extending to protect frame in compliance with indicated requirements.
      a. Finish: To match lock or latch.

2.08 DOOR PULLS AND PUSH PLATES

A. Manufacturers:
   1. Hager Companies: www.hagerco.com/#sle.
   2. Hiawatha, Inc, division of Activar Construction Products Group, Inc: www.activarcpg.com/hiawatha/#sle.
   3. Trimco: www.trimcohardware.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Door Pulls and Push Plates: Comply with BHMA A156.6.
   1. Pull Type: Straight, unless otherwise indicated.
   2. Push Plate Type: Flat, with square corners, unless otherwise indicated.
      a. Edges: Beveled, unless otherwise indicated.
   3. Material: Aluminum, unless otherwise indicated.
   4. Provide door pulls and push plates on doors without a lockset, latchset, exit device, or auxiliary lock unless otherwise indicated.
   5. On solid doors, provide matching door pull and push plate on opposite faces.

2.09 CLOSERS

A. Manufacturers; Surface Mounted:
   1. Corbin Russwin, Norton, Rixson, Sargent, or Yale; an Assa Abloy Group company: www.assaabloydss.com/#sle.
   2. Hager Companies: www.hagerco.com/#sle.
   3. Stanley, dormakaba Group: www.stanleyhardwarefordoors.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Closers: Comply with BHMA A156.4, Grade 1.
   1. Type: Surface mounted to door.
   2. Provide door closer on each exterior door.
   3. At corridor entry doors, mount closer on room side of door.
   4. At outswinging exterior doors, mount closer on interior side of door.

2.10 PROTECTION PLATES

A. Manufacturers:
   1. Rockwood; an Assa Abloy Group company: www.assaabloydss.com/#sle.
   2. C. R. Laurence Company, Inc: www.crl-arch.com/#sle.
   3. Hager Companies: www.hagerco.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Protection Plates: Comply with BHMA A156.6.

C. Metal Properties: Aluminum.
   1. Metal, Heavy Duty: Thickness 0.062 inch, minimum.

D. Edges: Beveled, on four sides unless otherwise indicated.

E. Fasteners: Countersunk screw fasteners.

2.11 KICK PLATES

A. Manufacturers:
   1. Hiawatha, Inc, an Activar Construction Products Group company: www.activarcpg.com/hiawatha/#sle.
   2. Ives, an Allegion brand: www.allegion.com/us/#sle.

B. Kick Plates: Provide along bottom edge of push side of every door with closer, except aluminum storefront and glass entry doors, unless otherwise indicated.
   1. Size: 8 inch high by 2 inch less door width (LDW) on push side of door.

2.12 WALL STOPS

A. Manufacturers:
   1. Rockwood; an Assa Abloy Group company: www.assaabloydss.com/#sle.
   2. Hager Companies: www.hagerco.com/#sle.
   3. Hiawatha, Inc, division of Activar Construction Products Group, Inc: www.activarcpg.com/hiawatha/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Wall Stops: Comply with BHMA A156.16, Grade 1 and Resilient Material Retention Test as described in this standard.
   1. Type: Bumper, concave, wall stop.
   2. Material: Aluminum housing with rubber insert.

2.13 THRESHOLDS

A. Manufacturers:
   1. Pemko; an Assa Abloy Group company: www.assaabloydss.com/#sle.
   2. Hager Companies: www.hagerco.com/#sle.
   3. National Guard Products, Inc: www.ngpinc.com/#sle.
   4. Reese Enterprises, Inc: www.reeseusa.com/#sle.

B. Thresholds: Comply with BHMA A156.21.
   1. Provide threshold at interior doors for transition between two different floor types, and over building expansion joints, unless otherwise indicated.
   2. Provide threshold at each exterior door, unless otherwise indicated.
   3. Type: Flat surface.
   4. Material: Aluminum.
   5. Threshold Surface: Fluted horizontal grooves across full width.
   6. Field cut threshold to profile of frame and width of door sill for tight fit.
   7. Provide non-corroding fasteners at exterior locations.

2.14 WEATHERSTRIPPING AND GASKETING

A. Manufacturers:
   1. Pemko; an Assa Abloy Group company: www.assaabloydss.com/#sle.
   2. Hager Companies: www.hagerco.com/#sle.
   3. National Guard Products, Inc: www.ngpinc.com/#sle.
   4. Reese Enterprises, Inc: www.reeseusa.com/#sle.
   5. Substitutions: See Section 01 6000 - Product Requirements.

B. Weatherstripping and Gasketing: Comply with BHMA A156.22.
   1. Head and Jamb Type: Adjustable.
   2. Door Sweep Type: Encased in retainer.
   3. Material: Aluminum, with brush weatherstripping.
   4. Provide weatherstripping on each exterior door at head, jambs, and meeting stiles of door pairs, unless otherwise indicated; .
   5. Provide door bottom sweep on each exterior door, unless otherwise indicated.

2.15 COAT HOOKS

A. Coat Hooks: Provide on room side of door, screw fastened.

B. Material: Brass.

2.16 SILENCERS

A. Silencers: Provide at equal locations on door frame to mute sound of door's impact upon closing.
   1. Single Door: Provide three on strike jamb of frame.
   2. Pair of Doors: Provide two on head of frame, one for each door at latch side.
   3. Material: Rubber, gray color.

2.17 FINISHES

A. Finishes: Provide door hardware of same finish, unless otherwise indicated.
   1. Primary Finish: 626; satin chromium plated over nickel, with brass or bronze base material (former US equivalent US26D); BHMA A156.18.
   2. Secondary Finish: 625; bright chromium plated over nickel, with brass or bronze base material (former US equivalent US26); BHMA A156.18.
      a. Use secondary finish in kitchens, bathrooms, and other spaces containing chrome or stainless steel finished appliances, fittings, and equipment; provide primary finish on one side of door and secondary finish on other side if necessary.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Use templates provided by hardware item manufacturer.

C. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item. As indicated in following list; unless noted otherwise in Door Hardware Schedule or on drawings.

D. Set exterior door thresholds with full-width bead of elastomeric sealant at each point of contact with floor providing a continuous weather seal; anchor thresholds with stainless steel countersunk screws.

3.02 ADJUSTING

A. Adjust hardware for smooth operation.

3.03 CLEANING

A. Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.

B. Clean adjacent surfaces soiled by hardware installation.

C. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.

END OF SECTION

HARDWARE GROUPS

GROUP 1 - SINGLE INTERIOR OFFICE FUNCTION

3 EA HINGES
1 EA OFFICE LOCK
1 EA MORTISE CYLINDER
1 EA WALL STOP

GROUP 2 – SINGLE INTERIOR STOREROOM FUNCTION

3 EA HINGES
1 EA STOREROOM LOCK
1 EA MORTISE CYLINDER
1 EA CLOSER
1 EA KICKPLATE
1 EA WALL STOP
ELECTRIC STRIKE UNDER SEPARATE CONTRACT – COORDINATE WITH OWNER
DOOR CONTACTS UNDER SEPARATE CONTRACT – COORDINATE WITH OWNER

GROUP 3 – SINGLE ALUMINUM EXTERIOR ENTRY FUNCTION

3 EA HINGES
1 EA EXIT DEVICE
1 EA MORTISE CYLINDER
1 EA RIM CYLINDER
1 EA OFFSET PULL
1 EA CLOSER
1 EA THRESHOLD
1 EA SWEEPS
ELECTRIC STRIKE UNDER SEPARATE CONTRACT – COORDINATE WITH OWNER

WEATHER STRIPPING TO BE SUPPLIED BY ALUMINUM DOOR AND FRAME SUPPLIER
DOOR CONTACT BY DIVISION 28

GROUP 4 – SINGLE ALUMINUM INTERIOR ENTRY FUNCTION

3 EA HINGES
1 EA PUSH BAR/OFFSET PULL
1 EA CLOSER
1 EA WALL STOP
1 EA THRESHOLD
ELECTRIC STRIKE UNDER SEPARATE CONTRACT – COORDINATE WITH OWNER

WEATHER STRIPPING TO BE SUPPLIED BY ALUMINUM DOOR AND FRAME SUPPLIER
DOOR CONTACT BY DIVISION 28

SECTION 08 8000

GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glazing units.

B. Glazing compounds and accessories.

1.02 RELATED REQUIREMENTS

A. Section 07 9200 - Joint Sealants: Sealants for other than glazing purposes.

B. Section 08 1113 - Hollow Metal Doors and Frames: Glazed lites in doors and borrowed lites.

C. Section 08 4313 - Aluminum-Framed Storefronts: Glazing furnished as part of storefront assembly.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015.

C. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2015).

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

E. ASTM C1036 - Standard Specification for Flat Glass; 2016.

F. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

G. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2014.

H. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.

I. GANA (SM) - GANA Sealant Manual; 2008.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by each of the affected installers.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data on Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

D. Certificate: Certify that products of this section meet or exceed specified requirements.

E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

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

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

1.07 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 40 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Glass Fabricators:
   1. Trulite Glass & Aluminum Solutions, LLC: www.trulite.com/#sle.
   2. Viracon, Inc: www.viracon.com/#sle.
   3. Substitutions: Refer to Section 01 6000 - Product Requirements.

B. Float Glass Manufacturers:
   1. Cardinal Glass Industries: www.cardinalcorp.com/#sle.
   2. Guardian Glass, LLC: www.guardianglass.com/#sle.
   3. Pilkington North America Inc: www.pilkington.com/na/#sle.
   4. Substitutions: Refer to Section 01 6000 - Product Requirements.

2.02 GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless otherwise indicated.
   1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
   2. Kind HS - Heat-Strengthened Type: Complies with ASTM C1048.
   3. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
   4. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.
   5. Tinted Type: ASTM C1036, Class 2 - Tinted, Quality - Q3, with color and performance characteristics as indicated.
   6. Thicknesses: As indicated; provide greater thickness as required for exterior glazing wind load design.

2.03 GLAZING UNITS

A. Monolithic Interior Vision Glazing:
   1. Applications: Interior glazing unless otherwise indicated.
   2. Glass Type: Annealed float glass.
   3. Tint: Clear.
   4. Thickness: 1/4 inch, nominal.

B. Monolithic Safety Glazing: Non-fire-rated.
   1. Applications:
      a. Glazed lites in doors, except fire doors.
      b. Sliding glass doors.
      c. Glazed sidelights to doors, except in fire-rated walls and partitions.
      d. Other locations required by applicable federal, state, and local codes and regulations.
      e. Other locations indicated on drawings.
   2. Glass Type: Fully tempered safety glass as specified.
   3. Tint: Clear.
   4. Thickness: 1/4 inch, nominal.

2.04 GLAZING COMPOUNDS

A. Glazing Putty: Polymer modified latex recommended by manufacturer for outdoor use, knife grade consistency; gray color.

B. Butyl Sealant: Single component; ASTM C920, Grade NS, Class 12-1/2, Uses M and A, Shore A hardness of 10 to 20; black color.

2.05 ACCESSORIES

A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.

B. Glazing Tape, Back Bedding Mastic Type: Preformed, butyl-based, 100 percent solids compound with integral resilient spacer rod applicable to application indicated; 5 to 30 cured Shore A durometer hardness; coiled on release paper; black color.

C. Glazing Clips: Manufacturer's standard type.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

3.02 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.03 INSTALLATION, GENERAL

A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.

B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

3.04 FIELD QUALITY CONTROL

A. Glass and Glazing product manufacturers to provide field surveillance of the installation of their products.

B. Monitor and report installation procedures and unacceptable conditions.

3.05 CLEANING

A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

B. Remove non-permanent labels immediately after glazing installation is complete.

C. Clean glass and adjacent surfaces after sealants are fully cured.

D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.06 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

SECTION 09 2116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.

B. Metal stud wall framing.

C. Acoustic insulation.

D. Gypsum wallboard.

1.02 REFERENCE STANDARDS

A. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2018.

B. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2017.

C. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2018.

D. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2019b.

E. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2018.

F. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.

G. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2016.

H. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).

I. ASTM E413 - Classification for Rating Sound Insulation; 2016.

J. GA-216 - Application and Finishing of Gypsum Panel Products; 2016.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum __ years of experience.

B. Manufacturer Qualifications: Member of Steel Stud Manufacturers Association (SSMA): www.ssma.com/#sle.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.

B. Interior Partitions, Indicated as Acoustic: Provide completed assemblies with the following characteristics:

1. Acoustic Attenuation: STC of 45-49 calculated in accordance with ASTM E413, based on tests conducted in accordance with ASTM E90.

2.02 METAL FRAMING MATERIALS

A. Manufacturers - Metal Framing, Connectors, and Accessories:

1. ClarkDietrich: www.clarkdietrich.com/#sle.

2. Jaimes Industries: www.jaimesind.com/#sle.
3. Marino: www.marinoware.com/#sle.
4. SCAFCO Corporation: www.scafco.com/#sle.
5. Steel Construction Systems: www.steelconsystems.com/#sle.
6. Substitutions: See Section 01 6000 - Product Requirements.

B. Non-structural Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf.
1. Studs: C-shaped with knurled or embossed faces.
2. Runners: U shaped, sized to match studs.

C. Partition Head To Structure Connections: Provide track fastened to structure with legs of sufficient length to accommodate deflection, for friction fit of studs cut short and fastened as indicated on drawings.

2.03 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
1. American Gypsum Company: www.americangypsum.com/#sle.
2. CertainTeed Corporation: www.certainteed.com/#sle.
3. Continental Building Products: www.continental-bp.com/#sle.
4. Georgia-Pacific Gypsum: www.gpgypsum.com/#sle.
5. National Gypsum Company: www.nationalgypsum.com/#sle.
6. Substitutions: See Section 01 6000 - Product Requirements.

B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
3. Thickness:
a. Vertical Surfaces: 5/8 inch.
b. Ceilings: 5/8 inch.

C. Ceiling Board: Special sag resistant gypsum ceiling board as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
1. Application: Ceilings, unless otherwise indicated.
2. Thickness: 1/2 inch.
3. Edges: Tapered.

2.04 GYPSUM WALLBOARD ACCESSORIES

A. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced. Thickness: 3 inch.

B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.

C. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.

PART 3 EXECUTION

3.01 EXAMINATION

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

3.02 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.

B. Studs: Space studs at 16 inches on center.

1. Extend partition framing to structure where indicated and to ceiling in other locations.
2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
3. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs with continuous bridging.

C. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

3.03 ACOUSTIC ACCESSORIES INSTALLATION

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

B. Acoustic Sealant: Install in accordance with manufacturer's instructions.

3.04 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

END OF SECTION

SECTION 09 3000
TILING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tile for floor applications.

B. Non-ceramic trim.

1.02 REFERENCE STANDARDS

A. ANSI A108/A118/A136 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium); 2019.

B. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2019.

C. ASTM C373 - Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products; 2018.

D. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2016a.

E. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.

F. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2019.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by affected installers.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

C. Verification Samples: Provide one full-size sample of each tile type specified.

D. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Tile: 1 percent of each size, color, and surface finish combination, but not less than 1 carton of each type.

1.05 QUALITY ASSURANCE

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

B. Installer Qualifications:
   1. Company specializing in performing tile installation, with minimum of five years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.07 FIELD CONDITIONS

A. Do not install solvent-based products in an unventilated environment.

B. Maintain ambient and substrate temperature above 50 degrees F and below 100 degrees F during installation and curing of setting materials.

PART 2 PRODUCTS

2.01 TILE

A. Porcelain Tile, Type CT1 & CT2: ANSI A137.1, standard grade.
   1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
   2. Size:
      a. CT1: 12 x 24 inch.
      b. CT2 Cove Base: 6 x 12 inch.
   3. Thickness: 5/16 inch (9mm).
   4. Edges: Rectified.
   5. Color(s): To be selected by Architect from manufacturer's standard range.
   6. Pattern: As indicated in drawings.
   7. Products:
      a. Caesar Ceramics USA; Stoneways: www.caesar.it/us/caesarusa/.
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.02 TRIM AND ACCESSORIES

A. Non-Ceramic Trim: Brushed stainless steel, style and dimensions to suit application, for setting using tile mortar or adhesive.
   1. Applications:
      a. Open edges of floor tile (for entrance mat inlay) - SCHIENE.
      b. Transition between floor finishes of different heights - RENO U.
   2. Manufacturers:
      a. Schluter-Systems: www.schluter.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.03 SETTING MATERIALS

A. Provide setting and grout materials from same manufacturer.

B. Manufacturers:
   1. ARDEX Engineered Cements: www.ardexamericas.com/#sle.
   2. Bostik Inc: www.bostik-us.com/#sle.
   3. Custom Building Products: www.custombuildingproducts.com/#sle.
   4. LATICRETE International, Inc: www.laticrete.com/#sle.
   5. Merkrete, by Parex USA, Inc: www.merkrete.com/#sle.
   6. TEC, an H.B. Fuller Construction Products Brand: www.tecspecialty.com/#sle.
   7. Substitutions: See Section 01 6000 - Product Requirements.

C. Epoxy Adhesive and Mortar Bond Coat: ANSI A118.3.
   1. Applications: As recommended by manufacturer for use with specified grout type.
   2. Products:
      a. Custom Building Products; EBM-Lite Epoxy Bonding Mortar: www.custombuildingproducts.com/#sle.
      b. LATICRETE International, Inc; LATICRETE LATAPOXY 300 Adhesive: www.laticrete.com/#sle.
      c. Merkrete, by Parex USA, Inc; Merkrete Pro Epoxy: www.merkrete.com/#sle.
      d. Substitutions: See Section 01 6000 - Product Requirements.

D. Organic Adhesive: ANSI A136.1, thinset mastic type.
   1. Applications: Use where no other type of bond coats are indicated.
   2. Products:
      a. Custom Building Products; ReliaBond Ceramic Tile Adhesive - Type 1: www.custombuildingproducts.com/#sle.
      b. LATICRETE International, Inc; LATICRETE 15 Premium Mastic: www.laticrete.com/#sle.

c. Merkrete, by Parex USA, Inc; Merkrete Merstik: www.merkrete.com/#sle.
d. Substitutions: See Section 01 6000 - Product Requirements.

2.04 GROUTS

A. Provide setting and grout materials from same manufacturer.

B. Epoxy Grout: ANSI A118.3 chemical resistant and water-cleanable epoxy grout.
1. Color(s): As selected by Architect from manufacturer's full line.
2. Products:
a. Custom Building Products; CEG-IG 100% Solids Industrial Grade Epoxy Grout: www.custombuildingproducts.com/#sle.
b. LATICRETE International, Inc; LATICRETE SPECTRALOCK PRO Premium Grout: www.laticrete.com/#sle.
c. Merkrete, by Parex USA, Inc; Merkrete Pro Epoxy: www.merkrete.com/#sle.

2.05 MAINTENANCE MATERIALS

A. Grout Sealer: Liquid-applied, moisture and stain protection for existing or new Portland cement grout.
1. Composition: Water-based colorless silicone.

2.06 ACCESSORY MATERIALS

A. Concrete Floor Slab Crack Isolation Membrane: Material complying with ANSI A118.12; not intended as waterproofing.
1. Crack Resistance: No failure at 1/8 inch gap, minimum.
2. Fluid or Trowel Applied Type:
a. Material: Synthetic rubber or Acrylic.
b. Thickness: 20 mils, maximum.
c. Products:
1) LATICRETE International, Inc; LATICRETE Blue 92 Anti-Fracture Membrane: www.laticrete.com/#sle.
2) Merkrete, by Parex USA, Inc; Merkrete Fracture Guard: www.merkrete.com/#sle.
3) TEC, an H.B. Fuller Construction Products Brand; TEC HydraFlex Waterproofing Crack Isolation Membrane: www.tecspecialty.com/#sle.
4) Substitutions: See Section 01 6000 - Product Requirements.
3. Peel-and-Stick Sheet Type:
a. Thickness: 20 mils, maximum.
b. Products:
1) Proflex Products, Inc; Maxxim Sim-40: www.proflex.us/#sle.
2) Protecto Wrap; AFM Anti-Fracture Membrane: www.protectowrap.com/#sle.
3) Substitutions: See Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.

C. Verify that subfloor surfaces are dust free and free of substances that could impair bonding of setting materials to subfloor surfaces.

D. Cementitious Subfloor Surfaces: Verify that substrates are ready for tiling installation by testing for moisture and alkalinity (pH).
1. Test as Follows:

a. Internal Relative Humidity: ASTM F2170.
b. Moisture Vapor Emission: ASTM F1869.

2. Obtain instructions if test results are not within limits recommended by tiling material manufacturer and setting material manufacturer.

3.02 PREPARATION

A. Protect surrounding work from damage.

B. Vacuum clean surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

D. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.

3.03 INSTALLATION - GENERAL

A. Install tile and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.19 , manufacturer's instructions, and TCNA (HB) recommendations.

B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.

C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.

E. Form internal angles square and external angles square or mitered.

F. Install non-ceramic trim in accordance with manufacturer's instructions.

G. Sound tile after setting. Replace hollow sounding units.

H. Keep control and expansion joints free of mortar, grout, and adhesive.

I. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

J. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.

K. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

3.04 INSTALLATION - FLOORS - THIN-SET METHODS

A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F113, dry-set or latex-Portland cement bond coat, with standard grout, unless otherwise indicated.

1. Where epoxy bond coat and grout are indicated, install in accordance with TCNA (HB) Method F131.
2. Where epoxy or furan grout is indicated, but not epoxy or furan bond coat, install in accordance with TCNA (HB) Method F115.

3.05 CLEANING

A. Clean tile and grout surfaces.

3.06 PROTECTION

A. Do not permit traffic over finished floor surface for 4 days after installation.

3.07 SCHEDULE

A. Refer to drawings.

END OF SECTION

SECTION 09 5100
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

1.02 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2019a.

B. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021.

C. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2017.

D. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2013.

E. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2020.

F. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2019.

1.03 ADMINISTRATIVE REQUIREMENTS

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

B. Do not install acoustical units until after interior wet work is dry.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on suspension system components and acoustical units.

C. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1.05 QUALITY ASSURANCE

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

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

1.06 FIELD CONDITIONS

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

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Acoustic Tiles/Panels:
   1. Armstrong World Industries, Inc: www.armstrongceilings.com/#sle.
   2. USG Corporation: www.usg.com/ceilings/#sle.
   3. Substitutions: See Section 01 6000 - Product Requirements.

B. Suspension Systems:
   1. Same as for acoustical units.

2.02 ACOUSTICAL UNITS

A. Acoustical Units - General: ASTM E1264, Class A.

B. Acoustical Panels, Type ACT1: Mineral fiber with membrane-faced overlay, with the following characteristics:
   1. Classification: ASTM E1264 Type IV.
   2. Size: 24 by 24 inches.
   3. Thickness: 3/4 inch.
   4. Light Reflectance: 0.90 percent, determined in accordance with ASTM E1264.
   5. NRC Range: 0.70 to 0.75, determined in accordance with ASTM E1264.
   6. Ceiling Attenuation Class (CAC): 35, determined in accordance with ASTM E1264.
   7. Panel Edge: Tegular.
   8. Color: White.
   9. Suspension System: Exposed grid.
   10. Products:
      a. USG Corporation; Mars Acoustical Panels: www.usg.com/ceilings/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

C. Acoustical Panels, Type ACT2: Mineral fiber with water-repellent membrane-faced overlay, with the following characteristics:
   1. Classification: ASTM E1264 Type IV.
      a. Form: 1 and 2.
      b. Pattern: "E" - lightly textured.
   2. Size: 24 by 24 inches.
   3. Thickness: 3/4 inch.
   4. Light Reflectance: 0.90 percent, determined in accordance with ASTM E1264.
   5. NRC Range: 0.70 to 0.75, determined in accordance with ASTM E1264.
   6. Ceiling Attenuation Class (CAC): 35, determined in accordance with ASTM E1264.
   7. Scrubbability: Passed, when tested in accordance with ASTM D2486.
   8. Washability: Passed, when tested in accordance with ASTM D2486.
   9. Panel Edge: Beveled (SLT) - 15/16" grid profile.
   10. Color: White.
   11. Suspension System: Exposed grid.
   12. Products:
      a. USG Corporation; Mars Healthcare Acoustical Panels: www.usg.com/ceilings/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.03 SUSPENSION SYSTEM(S)

A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.
   1. Materials:
      a. Steel Grid: ASTM A653/A653M, G30 coating, unless otherwise indicated.
      b. Aluminum Grid: Aluminum sheet, ASTM B209/B209M.

B. Exposed Suspension System: Aluminum grid and cap.
   1. Application(s): For use with acoustic panels type ACT3, in rooms with potentially high humidity conditions.
   2. Structural Classification: Intermediate-duty, when tested in accordance with ASTM C635/C635M.
   3. Profile: Tee; 15/16 inch face width.
   4. Finish: Baked enamel.
   5. Color: White.
   6. Products:

a. USG Corporation; Donn Brand AX/AXCE 15/16 inch Acoustical Suspension System: www.usg.com/ceilings/#sle.
b. Substitutions: See Section 01 6000 - Product Requirements.

C. Exposed Suspension System: Hot-dipped galvanized steel grid and cap.
1. Application(s): For use with acoustic panels type ACT1.
2. Structural Classification: Intermediate-duty, when tested in accordance with ASTM C635/C635M.
3. Profile: Tee; 15/16 inch face width.
4. Finish: Baked enamel.
5. Color: White.
6. Products:
a. USG Corporation; Donn Brand DX/DXL 15/16 inch Acoustical Suspension System: www.usg.com/ceilings/#sle.
b. Substitutions: See Section 01 6000 - Product Requirements.

D. Exposed Suspension System: Hot-dipped galvanized steel grid and cap.
1. Application(s): For use with acoustic panels type ACT2.
2. Structural Classification: Intermediate-duty, when tested in accordance with ASTM C635/C635M.
3. Profile: Tee; 9/16 inch face width.
4. Finish: Baked enamel.
5. Color: White.
6. Products:
a. USG Corporation; Centricitee DXT/DXLT 9/16 inch Acoustical Suspension System: www.usg.com/ceilings/#sle.
b. Substitutions: See Section 01 6000 - Product Requirements.

2.04 ACCESSORIES

A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

B. Hanger Wire: 12-gage 0.08 inch galvanized steel wire.

C. Hold-Down Clips: Manufacturer's standard clips to suit application.

D. Perimeter Moldings: Same metal and finish as grid.

E. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.02 PREPARATION

A. Install after major above-ceiling work is complete.

B. Coordinate the location of hangers with other work.

3.03 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

C. Locate system on room axis according to reflected plan.

D. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.

1. Use longest practical lengths.

E. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

H. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

I. Do not eccentrically load system or induce rotation of runners.

3.04 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

E. Cutting Acoustical Units:
1. Cut to fit irregular grid and perimeter edge trim.
2. Make field cut edges of same profile as factory edges.
3. Double cut and field paint exposed reveal edges.

3.05 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.06 SCHEDULE

A. Refer to drawings.

END OF SECTION

SECTION 09 6500
RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient tile flooring.

B. Resilient base.

C. Installation accessories.

1.02 REFERENCE STANDARDS

A. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).

B. ASTM E492 - Standard Test Method for Laboratory Measurement of Impact Sound Transmission Through Floor-Ceiling Assemblies Using the Tapping Machine; 2009, with Editorial Revision (2016).

C. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2019a, with Editorial Revision (2020).

D. ASTM F970 - Standard Test Method for Measuring Recovery Properties of Floor Coverings after Static Loading; 2017.

E. ASTM F1861 - Standard Specification for Resilient Wall Base; 2016.

F. RFCI (RWP) - Recommended Work Practices for Removal of Resilient Floor Coverings; 2011.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Shop Drawings: Indicate seaming plans and floor patterns.

D. Verification Samples: Submit one samples, 4 by 12 inch in size illustrating color and pattern for each resilient flooring product specified.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Flooring Material: 25 square feet of each type and color.
   3. Extra Wall Base: 15 linear feet of each type and color.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Store all materials off of the floor in an acclimatized, weather-tight space.

B. Maintain temperature in storage area between 55 degrees F and 90 degrees F.

C. Protect roll materials from damage by storing on end.

1.06 FIELD CONDITIONS

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

PART 2 PRODUCTS

2.01 TILE FLOORING

A. Vinyl Tile - Type LVT1: Printed film type, with transparent or translucent wear layer, ASTM F3261 Class I, Type B, Backing Class B, solid core, non-ortho Phthalate.
   1. Manufacturers:
      a. Mannington Commercial; City Park Collection: www.manningtoncommercial.com.
      b. Substitutions: See Section 01 6000 - Product Requirements.
   2. Performance Characteristics:
      a. Flexibility (ASTM F137): Passes - 1" Mandrel - No Crack/Break
      b. Dimensional Stability (ASTM F2199): Passes - Max 0.020 in/lin ft
      c. Squareness (ASTM F540): Passes - Max 0.010"
      d. Static Load (ASTM F970 mod.): Passes - 2,000 PSI; Residual Indent ≤ 0.005"
      e. Residual Indentation (ASTM F1914): Passes - < 8% Avg / 10% Single Value.
      f. Flooring Radiant Panel (ASTM E648): Passes - Class 1; = 0.45 watts/cm^2
      g. Smoke Density (ASTM E662): Passes - ≤ 450
      h. Slip Resistance (ASTM C1028): Passes - ≥ 0.5 Leather; 0.6 Rubber
      i. Resistance to Light (ASTM F1515): Passes
      j. Chemical Resistance (ASTM F925): Passes
      k. Resistance to Heat (ASTM F1514): Passes
   3. Plank Tile Size: 6 by 37 inch, nominal.
   4. Wear Layer Thickness: 20 mil (0.51mm).
   5. Total Thickness: 0.236 inch (6mm).
   6. Edge Treatment: Micro-bevel.
   7. Installation Method: Offset end joints by at least 6" and stagger to create random appearance, all arrows in the same direction.
   8. Color: As indicated on drawings.
   9. Warranty: Limited 15 year commercial warranty.

2.02 RESILIENT BASE

A. Resilient Base - Type RB1: ASTM F1861, Type TS rubber, vulcanized thermoset; style as scheduled.
   1. Manufacturers:
      a. Johnsonite, a Tarkett Company; Baseworks Thermoset Rubber Wall Base: www.johnsonite.com.
      b. Substitutions: See Section 01 6000 - Product Requirements.
   2. Height: 4 inch.
   3. Thickness: 0.125 inch.
   4. Finish: Satin.
   5. Length: Roll.
   6. Color: As indicated on drawings.

2.03 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.

B. Adhesive for Vinyl Flooring: As recommended by manufacturer, low VOC.

C. Moldings, Transition and Edge Strips: Same material as flooring.
   1. Provide from same manufacturer as resilient wall base.
   2. Color: Same as for resilient wall base. Refer to drawings.

D. Filler for Coved Base: Plastic.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
   1. Test in accordance with Section 09 0561.
   2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

3.02 PREPARATION

A. Remove existing resilient flooring and flooring adhesives; follow the recommendations of RFCI (RWP).

B. Prepare floor substrates for installation of flooring in accordance with Section 09 0561.

C. Remove subfloor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with subfloor filler to achieve smooth, flat, hard surface.

D. Prohibit traffic until filler is fully cured.

E. Clean substrate.

F. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.

3.03 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

C. Loose-Laid Installation: Set flooring in place in accordance with manufacturer's instructions.

D. Where type of floor finish, pattern, or color are different on opposite sides of door, terminate flooring under centerline of door.

E. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
   1. Resilient Strips: Attach to substrate using adhesive.

F. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.04 INSTALLATION - TILE FLOORING

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

B. Lay flooring with joints and seams parallel to building lines to produce symmetrical pattern.

C. Install loose-laid tile, fit interlocking edges tightly.

D. Install plank tile with a random offset of at least 6 inches from adjacent rows.

3.05 INSTALLATION - RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.

B. Install base on solid backing. Bond tightly to wall and floor surfaces.

C. Scribe and fit to door frames and other interruptions.

3.06 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

3.07 PROTECTION

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

3.08 SCHEDULE

A. Refer to drawings.

END OF SECTION

SECTION 09 6813
TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Carpet tile, fully adhered.

B. Removal of existing carpet tile.

1.02 REFERENCE STANDARDS

A. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials; 2016.

B. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2019a, with Editorial Revision (2020).

C. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2019.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

C. Samples: Submit one carpet tile illustrating color and pattern design for each carpet color selected.

D. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Carpet Tiles: Quantity equal to 5 percent of total installed of each color and pattern installed.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Tile Carpeting:
   1. Mannington Commercial: www.manningtoncommercial.com.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Tile Carpeting, Type CPT1: Multi-Level Patterned Loop construction.
   1. Product: Spin Collection, Product Equalizer manufactured by Mannington.
   2. Plank Size: 24 by 24 inch.
   3. Performance characteristics:
      a. Critical Radiant Flux: Minimum of 0.45 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
      b. Smoke Density: Less than or equal to 450 when tested in accordance with ASTM E662.
      c. Surface Flammability Ignition: Passes ASTM D2859 (the "pill test").

d. Static (AATCC 134): Less than 3.0 kV at 20 percent humidity .
4. Yarn System: Antron Lumena Type 6,6 Nylon.
5. Dye Method: 100 percent solution dyed.
6. Machine Gauge: 1/10 inch.
7. Stitches: 10.33 per inch.
8. Pile Thickness: 0.110 inch (2.79 mm).
9. Tufted Yarn Weight: 22 oz/sq yd.
10. Pile Density: 7200 oz/cu yd.
11. Backing: Infnity 2 Modular.
12. Install Method: Vertical ashlar.

2.03 ACCESSORIES

A. Sub-Floor Filler: White premix latex; type recommended by flooring material manufacturer.

B. Adhesives:
1. Compatible with materials being adhered; maximum VOC content as specified in Section 01 6116.

C. Carpet Tile Adhesive: As recommended by carpet tile manufacturer for substrate conditions; releasable type.
1. Provided by carpet manufacturer for warranted carpet tile installation.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.

B. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to sub-floor surfaces.

C. Cementitious Sub-floor Surfaces: Verify that substrates are dry enough and ready for flooring installation by testing for moisture and pH.
1. Test in accordance with Section 09 0561.
2. Obtain instructions if test results are not within limits recommended by flooring material manufacturer and adhesive materials manufacturer.

D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Remove existing carpet.

B. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

C. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler.

D. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.

E. Vacuum clean substrate.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of sub-floor conditions.

B. Install carpet tile in accordance with manufacturer's instructions.

C. Blend carpet from different cartons to ensure minimal variation in color match.

D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.

E. Locate change of color or pattern between rooms under door centerline, unless otherwise shown in drawings.

F. Fully adhere carpet tile to substrate.

G. Trim carpet tile neatly at walls and around interruptions.

H. Complete installation of edge strips, concealing exposed edges.

3.04 CLEANING

A. Remove excess adhesive without damage, from floor, base, and wall surfaces.

B. Clean and vacuum carpet surfaces.

3.05 SCHEDULE

A. Refer to drawings.

END OF SECTION

SECTION 09 9000
PAINTING AND COATING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints and other coatings.

C. Materials for backpriming woodwork.

D. Scope: Finish all interior and exterior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:
   1. Mechanical and Electrical:
      a. In finished areas, paint all insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.
      b. In finished areas, paint shop-primed items.
      c. Paint interior surfaces of air ducts and convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.
      d. Paint dampers exposed behind louvers, grilles, and convector and baseboard cabinets to match face panels.
   2. Safety striping on floors.

E. Do Not Paint or Finish the Following Items:
   1. Items fully factory-finished unless specifically so indicated; materials and products having factory-applied primers are not considered factory finished.
   2. Items indicated to receive other finishes.
   3. Items indicated to remain unfinished.
   4. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
   5. Non-metallic roofing and flashing.
   6. Stainless steel, anodized aluminum, zinc, bronze, terne, and lead items.
   7. Marble, granite, slate, and other natural stones.
   8. Floors, unless specifically so indicated.
   9. Ceramic and other tiles.
   10. Brick, architectural concrete, cast stone, integrally colored plaster and stucco.
   11. Glass.
   12. Acoustical materials, unless specifically so indicated.
   13. Concealed pipes, ducts, and conduits.
   14. Existing compressed air lines (distribution system) to remain.

1.02 RELATED REQUIREMENTS

A. Section 01 2200 - Unit Prices: Skimming materials.

B. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

C. Section 22 0553 - Identification for Plumbing Piping and Equipment: Color coding scheme for items to be painted under this section.

D. Section 26 0553 - Identification for Electrical Systems: Color coding scheme for items to be painted under this section.

1.03 DEFINITIONS

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

1.04 REFERENCE STANDARDS

A. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2016.

B. ASTM D3359 - Standard Test Method for Measuring Adhesion by Tape Test, Method A.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on all finishing products, including VOC content.

C. Samples: Submit two painted samples, illustrating selected colors for each color and paint system selected . Submit on paper, 5 x 7 inch minimum size.

D. Manufacturer's Instructions: Indicate special surface preparation procedures.

E. Maintenance Data: Submit data on cleaning, touch-up, and repair of painted and coated surfaces.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Paint and Coatings: 1 gallon of each color; store where directed.
   3. Label each container with color in addition to the manufacturer's label.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum five years experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.08 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

D. Minimum Application Temperature for Varnish Finishes: 65 degrees F for interior or exterior, unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 PAINTS AND COATINGS - GENERAL

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

B. Paints and Coatings: Ready mixed, unless intended to be a field-catalyzed coating.

1. Provide paints and coatings of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
2. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
3. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color.
4. Supply each coating material in quantity required to complete entire project's work from a single production run.
5. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.

C. Primers: Use specified primers, unless other primer is required or recommended by manufacturer of top coats; where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.

D. Volatile Organic Compound (VOC) Content: Comply with Section 01 6116.

E. Chemical Content: The following compounds are prohibited:
1. Aromatic Compounds: In excess of 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
2. Acrolein, acrylonitrile, antimony, benzene, butyl benzyl phthalate, cadmium, di (2-ethylhexyl) phthalate, di-n-butyl phthalate, di-n-octyl phthalate, 1,2-dichlorobenzene, diethyl phthalate, dimethyl phthalate, ethylbenzene, formaldehyde, hexavalent chromium, isophorone, lead, mercury, methyl ethyl ketone, methyl isobutyl ketone, methylene chloride, naphthalene, toluene (methylbenzene), 1,1,1-trichloroethane, vinyl chloride.
3. Paints and coatings may not contain Lead or Chromate VI.

F. Flammability: Comply with applicable code for surface burning characteristics.

G. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

H. Colors: As indicated on drawings
1. Extend colors to surface edges; colors may change at any edge as directed by Architect.
2. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling they are mounted on/under, unless noted otherwise.
3. In utility areas, finish equipment, piping, conduit, and exposed duct work in colors according to the color coding scheme indicated.

2.02 PAINT SYSTEMS - EXTERIOR

A. Touch up exterior paint adjacent to new Work where occurs. Coordinate with Owner.

B. Manufacturers:
1. Basis of Design: Sherwin Williams; www.sherwin-williams.com.
2. Other Acceptable Manufacturers;
   a. Benjamin Moore & Co.; www.benjaminmoore.com.
3. Substitutions: See Section 01 6000 - Product Requirements.

C. Ferrous Metals, Primed, Latex, 2 Coat:
1. Touch-up with rust-inhibitive primer recommended by top coat manufacturer.
2. Semi-gloss: Two coats of latex enamel; B66W00651 Pro Industrial Acrylic Coating Semi-Gloss.

D. Ferrous Metals, Unprimed, Latex, 3 Coat:
1. Primer: One coat of primer; B66W00310 Pro Industrial Pro-Cryl Universal Primer.
2. Semi-gloss: Two coats of latex enamel; B66W00651 Pro Industrial Acrylic Coating Semi-Gloss.

2.03 PAINT SYSTEMS - INTERIOR

A. Manufacturers:
   1. Basis of Design: Sherwin Williams Company; www.sherwin-williams.com.
   2. Other Acceptable Manufacturers;
      a. Benjamin Moore & Co.; www.benjaminmoore.com.
   3. Substitutions: See Section 01 6000 - Product Requirements.

B. Concrete, Opaque, Latex, 3 Coat:
   1. One coat of block filler; B25W25 PrepRite Interior/Exterior Latex Block Filler.
   2. Primer: One coat; B66W00310 Pro Industrial Pro-Cryl Universal Acrylic Primer.
   3. Semi-gloss: Two coats; B66W00651 Pro Industrial Acrylic Coating Semi-Gloss.

C. Ferrous Metals, Unprimed, Latex-Acrylic, 3 Coat:
   1. One coat of latex primer; B66W00310 Pro Industrial Pro-Cryl Universal Primer.
   2. Semi-gloss: Two coats of latex-acrylic enamel; B66W00651 Pro Industrial Acrylic Coating Semi-Gloss.

D. Ferrous Metals, Primed, Latex-Acrylic, 2 Coat:
   1. Touch-up with latex primer, as recommended by manufacturer.
   2. Semi-gloss: Two coats of latex-acrylic enamel; B66W00651 Pro Industrial Acrylic Coating Semi-Gloss.

E. Gypsum Board/Plaster, Latex-Acrylic, 3 Coat:
   1. One coat of latex-acrylic primer sealer; B28W02600 ProMar 200 Zero VOC Interior Latex Primer.
   2. Eggshell: Two coats of latex-acrylic enamel; B20W02651 ProMar 200 Zero VOC Interior Latex, Eg-Shel..
   3. Flat: Two coats of latex-acrylic enamel; B30W02651 ProMar 200 Zero VOC Interior Latex, Flat.

2.04 ACCESSORY MATERIALS

A. Accessory Materials: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required to achieve the finishes specified whether specifically indicated or not; commercial quality.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin application of coatings until new substrates have been properly installed.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

D. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

E. Test shop-applied primer for compatibility with subsequent cover materials.

F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1. Gypsum Wallboard: 12 percent.
   2. Plaster and Stucco: 12 percent.
   3. Concrete: 12 percent.

3.02 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to coating application.
   1. At existing walls where wall-mounted items have been removed, fill all holes, sand down rough textures and patch wall surface as needed for a smooth, uniform substrate.
   2. Final painted area should have a uniform appearance across entire painted surface.
   3. If surface cannot be prepared to achieve this appearance, notify Architect in writing, outlining steps that could be taken to achieve the desired results.
   4. Refer to Section 01 2200 - Unit Prices.

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

C. Remove or repair existing coatings that exhibit surface defects.

D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

E. Seal surfaces that might cause bleed through or staining of topcoat.

F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

G. Gypsum Board Surfaces to be Painted: Fill minor defects with filler compound. Spot prime defects after repair.

H. Plaster Surfaces to be Painted: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.

I. Corroded Steel and Iron Surfaces to be Painted: Prepare using at least SSPC-SP 2 (hand tool cleaning) or SSPC-SP 3 (power tool cleaning) followed by SSPC-SP 1 (solvent cleaning).

J. Uncorroded Uncoated Steel and Iron Surfaces to be Painted: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand or power tool wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Prime paint entire surface; spot prime after repairs.

K. Metal Doors to be Painted: Prime metal door top and bottom edge surfaces.

3.03 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply each coat to uniform coating thickness in accordance with manufacturer's instructions, not exceeding manufacturer's specified maximum spread rate for indicated surface; thins, brush marks, roller marks, orange-peel, or other application imperfections are not permitted.

C. Always work toward a natural break in the surface and maintain a wet edge during application.

D. Allow manufacturer's specified drying time, and ensure correct coating adhesion, for each coat before applying next coat.

E. Where paint application abuts other materials or other coating color, terminate coating with a clean sharp termination line without coating overlap.

F. Inspect each coat before applying next coat; touch-up surface imperfections with coating material, feathering, and sanding if required; touch-up areas to achieve flat, uniform surface without surface defects visible from 5 feet (1.5 m).

G. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.

H. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

I. Apply each coat to uniform appearance.

J. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.

K. Sand metal surfaces lightly between coats to achieve required finish.

L. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

M. Do not apply over moving cracks, control joints or expansion joints.

N. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

O. Paint safety lines on floors as indicated in drawings and approved by Owner.

3.04 CLEANING

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

B. Clean excess coating materials, and coating materials deposited on surfaces not indicated to receive coatings, as construction activities of this section progress; do not allow to dry.

C. Re-install hardware, electrical equipment plates, mechanical grilles and louvers, lighting fixture trim, and other items that have been removed to protect from contact with coatings.

D. Reconnect equipment adjacent to surfaces indicated to receive coatings.

E. Relocate to original position equipment and fixtures that have been moved to allow application of coatings.

F. Remove protective materials.

3.05 PROTECTION

A. Protect finished coatings until completion of project.

3.06 SCHEDULE

A. Refer to drawings.

END OF SECTION

SECTION 12 2400
WINDOW SHADES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Interior manual roller shades.

B. Salvage existing roller shades.

1.02 REFERENCE STANDARDS

A. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015.

B. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2019.

1.03 ADMINISTRATIVE REQUIREMENTS

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets, including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.

C. Verification Samples: Minimum size 6 inches square, representing actual materials, color and pattern.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

B. Installer Qualifications: Company specializing in performing work of this type with minimum three years of documented experience with shading systems of similar size and type.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.

B. Handle and store shades in accordance with manufacturer's recommendations.

1.07 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Interior Manually Operated Roller Shades:
   1. Draper, Inc: www.draperinc.com/#sle.
   2. Hunter Douglas Architectural: www.hunterdouglasarchitectural.com/#sle.
   3. SWFcontract, a division of Springs Window Fashions, LLC.: www.swfcontract.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ROLLER SHADES

A. General:
   1. Modify salvaged window shades or provide new shades to match existing.
   2. Provide shade system components that are easy to remove or adjust without removal of mounted shade brackets.
   3. Provide shade system that operates smoothly when shades are raised or lowered.

B. Roller Shades Type WT1:
   1. Basis of Design: Existing.

2. Description - Interior Roller Shades: Single roller, manually operated fabric window shade system complete with mounting brackets, roller tubes, hembars, hardware, and accessories.
    a. Drop Position: Regular roll.
    b. Roll Direction: Roll down, closed position is at window sill.
    c. Mounting: Window jamb mounted - inside, between jambs.
    d. Fabric: To match existing
3. Brackets and Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
4. Roller Tubes: As required for type of shade operation.
5. Hembars: Designed to maintain bottom of shade straight and flat.
6. Manual Operation for Interior Shades:
    a. Clutch Operator: Manufacturer's standard material and design, permanently lubricated.
    b. Drive Chain: Continuous loop beaded ball chain, 95 pounds minimum breaking strength. Provide upper and lower limit stops.

2.03 SHADE FABRIC

A. Fabric - Type WT1: Nonflammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.
    1. Match existing.
    2. Performance Requirements:
        a. Flammability: Pass NFPA 701 large and small tests.
        b. Fungal Resistance: No growth when tested according to ASTM G21.
    3. Openness Factor: Match existing.
    4. Color: Match existing.

2.04 ROLLER SHADE FABRICATION

A. Field measure finished openings prior to ordering or fabrication.

B. Dimensional Tolerances: Fabricate shades to fit openings within specified tolerances.
    1. Vertical Dimensions: Fill openings from head to sill with 1/2 inch space between bottom bar and window stool.
    2. Horizontal Dimensions - Inside Mounting: Fill openings from jamb to jamb, with light gaps to match existing shades.

C. At openings requiring continuous multiple shade units with separate rollers, locate roller joints at window mullion centers; butt rollers end-to-end.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine finished openings for deficiencies that may preclude satisfactory installation.

B. Start of installation shall be considered acceptance of substrates.

3.02 PREPARATION

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

B. Coordinate with window installation and placement of concealed blocking to support shades.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.

B. Adjust level, projection, and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.04 CLEANING

A. Clean soiled shades and exposed components as recommended by manufacturer.

B. Replace shades that cannot be cleaned to "like new" condition.

3.05 PROTECTION

A. Protect installed products from subsequent construction operations.

B. Touch-up, repair, or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 12 4813

ENTRANCE FLOOR MATS AND FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Extruded aluminum entrance floor grilles.

1.02 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data indicating properties of walk-off surface, component dimensions and recessed frame characteristics.

C. Shop Drawings: Indicate dimensions and details for recessed frame.

D. Maintenance Data: Include cleaning instructions, and stain removal procedures.

1.03 FIELD CONDITIONS

A. Recessed Conditions: Coordination with Division 03 00 00 Concrete specifications is required. For proper installation, the concrete recess must be flat and smooth throughout. If the recess is formed by a concrete contractor, the pour dimensions may require leveling grout to achieve the proper depth and a smooth finish. The final recess depth will match the specified product and must be field verified. For proper frame installation, the side walls of the concrete recess must also be straight and smooth. Inconsistencies with the recess and side walls must be remediated prior to product installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Entrance Floor Grilles and Gratings:
   1. Basis of Design: Construction Specialties Inc.: www.c-sgroup.com.
   2. Pawling Corporation: www.pawling.com/#sle.
   3. Reese Enterprises, Inc: www.reeseusa.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

2.02 ENTRANCE FLOOR GRILLES AND GRATINGS

A. Entrance Floor Grilles: Recessed extruded aluminum grille assembly with nominal 1 inch wide tread strips running perpendicular to traffic flow, slots between treads, and perimeter frame forming sides of recess; grille hinged for access to recess.
   1. Recess Depth: 3/8 inches.
   2. Tread Surfaces: Polyprolylene brush, exterior grade (EC).
   3. Colors: As indicated on drawings.
   4. Size: As indicated on drawings.
   5. Frame: Anodized aluminum for embedding in concrete; 1/4 inch exposed trim; stud or hook concrete anchors.
      a. Color: Mill (standard) finish.
   6. Slip Resistance: In accordance with ASTM D-2047-96, Coefficient of Friction, minimum 0.60 or accessible routes.
   7. Product:
      a. Pedimat M1 Surface Mounted Pipestem Frame.

B. Structural Capacity: Capable of supporting a rolling load of 300 pounds without permanent deformation or noticeable deflection.

C. Vibration Resistant Fabrication: All members welded, riveted, or bolted; no snap or friction connections.

2.03 MATERIALS

A. Aluminum - ASTM B 221, alloy 6063-T5, 6063-T6 for extrusions.

B. Flexible EPDM extrusions.

2.04 FABRICATION

A. Construct recessed mat frames square, tight joints at corners, rigid. Coat surfaces with protective coating where in contact with cementitious materials.

B. Fabricate mats in single unit sizes; fabricate multiple mats where indicated on drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that floor opening for mats are ready to receive work.

3.02 PREPARATION

A. Verify size of floor recess before fabricating mats.

B. Vacuum clean floor recess.

3.03 INSTALLATION

A. Install frames to achieve flush plane with finished floor surface.

B. Install walk-off surface after cleaning of finish flooring.

3.04 TOLERANCES

A. Maximum Gap Formed at Recessed Frame From Mat Size: 1/4 inch.

END OF SECTION

SECTION 22 4000

PLUMBING FIXTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Water closets.

B. Urinals.

C. Lavatories.

D. Wall-hung, solid surface, multistation lavatory units.

E. Shower receptor and trim.

F. Wash fountains.

1.02 REFERENCE STANDARDS

A. ASME A112.6.1M - Floor-Affixed Supports for Off-the-Floor Plumbing Fixtures for Public Use; 1997 (Reaffirmed 2017).

B. ASME A112.18.1 - Plumbing Supply Fittings; 2018, with Errata.

C. ASME A112.19.2 - Ceramic Plumbing Fixtures; 2018, with Errata.

D. NSF 61 - Drinking Water System Components - Health Effects; 2019.

E. NSF 372 - Drinking Water System Components - Lead Content; 2016.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

PART 2 PRODUCTS

2.01 GENERAL

A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 HIGH EFFICIENCY FLUSH VALVE WATER CLOSETS

A. Wall Hung: WC - Elongated Siphon Jet
   1. ASME A112.19.2M; wall hung, siphon jet vitreous china closet bowl, with elongated rim, 1-1/2 inch top spud, china bolt caps. Designed for flush of 1.28 gpm or less.
   2. Seat:
      a. Solid white plastic, open front, extended back, brass bolts, without cover.
   3. Flush Valves:
      a. Exposed Flush Valve:
         1) ASME A112.18.1; Manual flush, 1.28 gpm maximum, exposed chrome plated, diaphragm type with oscillating handle, escutcheon, seat bumper, integral screwdriver stop and vacuum breaker.
         2) Bid Option Flush Valve operation: Battery powered, sensor operated.
   4. Water Closet Carrier:
      a. Manufacturers:
         1) JOSAM Company: www.josam.com.
         2) Sloan Valve Company: www.sloanvalve.com.
         3) Mifab Manufacturing, Inc: www.mifab.com.
         4) Wade Drains, Division of Tyler Pipe: www.wadedrains.com.
         5) Zurn Industries, Inc: www.zurn.com.
         6) Substitutions: See Section 01600 - Product Requirements.

b. ASME A112.6.1M; adjustable cast iron frame, integral drain hub and vent, adjustable spud, lugs for floor and wall attachment, threaded fixture studs with nuts and washers. Minimum of three floor connection points.

2.03 WALL HUNG URINALS

A. Wall Hung Urinal Manufacturers:
   1. American Standard Inc; WASHBROOK Urinal: www.americanstandard.com.
   2. Kohler Company: www.kohler.com
   3. Zurn; www.zurn.com
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Urinals: Vitreous china, ASME A112.19.2, wall hung with side shields and concealed carrier.
   1. Flush Volume: 0.125 gallons, maximum.
   2. Flush Style: Washout.
   3. Flush Valve: Exposed (top spud).
   4. Flush Operation: Manual, oscillating handle.
   5. Bid Option Flush Operation: Battery powered sensor.
   6. Trap: Integral.
   7. Removable stainless steel strainer.
   8. Supply Size: 3/4 inch.
   9. Outlet Size: 2 inches.

C. Carriers:
   1. Manufacturers:
      a. JOSAM Company: www.josam.com.
      b. Sloan Valve Company: www.sloanvalve.com.
      c. Mifab Manufacturing, Inc: www.mifab.com.
      d. Wade Drains, Division of Tyler Pipe: www.wadedrains.com.
      e. Zurn Industries, Inc: www.zurn.com.
      f. Substitutions: See Section 01600 - Product Requirements.
   2. ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded fixture studs for fixture hanger, bearing studs.

2.04 LAVATORIES

A. Lavatory Manufacturers:
   1. American Standard Inc; Model Lucerne: www.americanstandard.com.
   2. Substitutions: See Section 01 6000 - Product Requirements.
   3. Substitutions: Equivalent to listed in material and size.

B. Vitreous China Wall Hung Basin: ASME A112.19.2; vitreous china wall hung lavatory, 20 by 20 inch minimum, with 4 inch high back, rectangular basin with splash lip, and front overflow.
   1. Supply Faucet Manufacturers:
      a. Chicago Faucets; Model 2200-4CP: www.chicagofaucets.com.
   2. Supply Faucet: ASME A112.18.1; chrome plated supply fitting with open grid strainer, water economy aerator with maximum flow of 0.5 gallon per minute (low-flow), single lever handle.
   3. Bid Option Supply Faucet: Similar in style as base bid. ASME A112.18.1; chrome plated supply fitting with open grid strainer, water economy aerator with maximum flow of 0.5 gallon per minute (low-flow), battery powered, sensor operated.
   4. Accessories:
      a. Chrome plated 17 gage brass P-trap with clean-out plug and arm with escutcheon.
      b. Thermostatic mixing valve conforming to MN Plumbing Code.
      c. Screwdriver stops.
      d. Rigid supplies.
      e. Carrier:

1) ASME A112.6.1M; cast iron and steel frame with tubular legs, lugs for floor and wall attachment, threaded studs for fixture hanger, bearing plate and studs.

f. Under Sink Protection:

1) ADA compliant under sink protection fully covering piping and traps. Molded vinyl with smooth cleanable surface. Removable and reinstallable.

(a) Manufacturer: IPS Corporation; Truebro HC500R.

2.05 SINKS

A. Double Compartment Bowl (SK-1):

1. ASME A112.19.3M; 33 x 22 x 6.5 inch outside dimensions, 22 Gage thick, Type 304 stainless steel, self-rimming and undercoated, with ledge back drilled for trim.
   a. Drains: 3-1/2 inch crumb cup with stopper and tailpiece.
   b. Manufacturers:
      1) American Standard: www.americanstandard.com.
      2) Kohler Company; www.kohler.com
      3) Dayton Sinks; Model D3322: www.elkay.com.
      4) Elkay: www.elkay.com.
      5) Kindred: www.kindred-sinkware.com.
      6) Just Manufacturing: www.justmfg.com.
      7) Advance Tabco.
      8) Substitutions: See Section 01600 - Product Requirements.
2. Supply Faucet:
   a. Brass body with polished chrome finish, single lever with ceramic disc valves, high arch (minimum of 8.5 inches above deck) spout, 2 function pull down sprayhead with stream and spray discharge, 1.8 gpm flow, braided hose, and magnetic spray head docking system.
   b. Supply Faucet Manufacturers:
      1) Kohler Company: www.kohler.com
      2) Chicago Faucet Inc: www.chicagofaucet.com.
      3) Delta Commercial Faucet Company; Model 9113-DST: www.deltafaucet.com.
      4) Elkay: www.elkay.com.
      5) Zurn Industries, Inc: www.zurn.com.
      6) Substitutions: See Section 01600 - Product Requirements.
3. Accessories: Chrome plated 17 gage brass P-trap, extensions, and arm with escutcheon, wheel handle stop, flexible supplies.

2.06 SHOWER RECEPTORS

A. Shower Receptor: ADA compliant for 36 inch by 36 inch interior dimensioned single threshold transfer shower enclosure. Textured slip resistant floor and threshold with bevelled front. Built from one of the material choices listed for installation on existing level concrete floor.
   1. Solid plastic resin casting, self supporting.
   2. Acrylic/fiberglass composite requiring mortar bed support.
   3. Gelcoat/fiberglass composite requiring mortar bed support.
   4. Color and Pattern: As selected by Architect from manufacturer's full line.
   5. Manufacturers:
      a. American Standard, Inc; A8009D-FCO: www.americanstandard-us.com.
      b. Best Bath Systems; P3838B5B.V2: www.bestbath.com.
      c. Inpro; BioPrism Standard ADA: www.inprocorp.com.
      d. Substitutions: See Section 22 0100.

B. Drain Trim: Removable chrome plated strainer and tail piece.

2.07 SHOWERS

A. Shower Trim:
   1. Dual shower unit with separate diverter valve, for wall shower and separate handshower.

a. Concealed in-wall single lever pressure balancing shower control valve. Solid brass fabricated body. Metal lever handle-ADA compliant, field adjustable to limit handle rotation into hot water zone. All parts shall be replaceable from the front of the valve Integral stops and checks. Polished chrome plated finish.
b. Cast Vandal Resistant Fixed Spray Showerhead, 30 º spray angle, 2.0USgpm@80psi, concealed brass mounting plate.
c. 69" Long Chrome plated Brass Double Spiral Hose with Quick Disconnect, ASSE vacuum breaker, Wall elbow, 48" Slide/grab bar.

2. Trim Manufacturers:
a. Chicago Faucet Inc: www.chicagofaucet.com.
b. Delta Faucet Company: www.deltafaucet.com.
c. Sloan Valve Company: www.sloanvalve.com.
d. Zurn Industries, Inc: www.zurn.com.
e. Substitutions: See Section 01600 - Product Requirements.

2.08 WASH FOUNTAINS

A. Wash Fountain Manufacturers:
1. Acorn Engineering Company: www.acorneng.com.
2. Bradley Corporation; Model Sentry SN2004: www.bradleycorp.com.
3. Intersan Manufacturing Company: www.intersanus.com.

B. Bowl:
1. Semi-circular, 54 inch diameter, shallow bowl stainless steel washfountain, floor mounted.
a. Infrared control with plug in transformer.
b. Standard height.
c. 4 users.
d. Offline vent with supplies from below.
e. Thermostatic mixing valve conforming to MN Plumbing Code.
f. Backsplash.
g. Combination stop, strainer, and check valves.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

B. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.02 PREPARATION

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

3.03 INSTALLATION

A. Install each fixture with trap, easily removable for servicing and cleaning.

B. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.

C. Install components level and plumb.

D. Install and secure fixtures in place with wall supports and bolts.

E. Provide shower base support as required by manufacturer's installation instructions.

F. Seal fixtures to wall and floor surfaces with sealant as specified in Section 07 9005, color to match fixture.

3.04 INTERFACE WITH WORK OF OTHER SECTIONS

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

3.05 ADJUSTING

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

3.06 CLEANING

A. Clean plumbing fixtures and equipment.

3.07 PROTECTION

A. Protect installed products from damage due to subsequent construction operations.

B. Do not permit use of fixtures by construction personnel.

C. Repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 23 0100
HVAC GENERAL PROVISIONS

PART 1 GENERAL

1.01 CONDITIONS OF THE CONTRACT

A. The Conditions of the Construction Contract and applicable provisions of Division I - General Requirements, as well as these General Provisions, shall apply to all Sections of Division 23.

1.02 SCOPE

A. The work to be done under this Division of the Specifications shall include the furnishing of all labor, materials, equipment and services necessary for the proper completion of all of the HVAC work as shown on the drawings and herein specified.

B. In general, this shall include the furnishing and installing of all heating, refrigeration, ventilation, and temperature control systems, complete with auxiliaries, as may be required to make a complete and properly operating installation.

C. Only such items as are hereinafter specified or indicated on the drawings to be furnished by others, shall be considered to be furnished by others. All other items are to be considered as a part of this Contract, and shall be so bid.

D. The omission of specific reference to any parts necessary to, or reasonably incidental to, a complete installation shall not be construed as releasing the Contractor from furnishing and installing same.

E. Applicable provisions of the following sections shall apply to all sections for HVAC Work.

1.03 RELATED WORK

A. This project includes commissioning of HVAC systems. Refer to Sections 01 9113 & 23 0800 for each division 23 section's responsibilities.

1.04 DEFINITIONS

A. Provide: Under this Contract, Contractor shall furnish and install item or items specified. Contractor shall perform all labor and furnish all materials and equipment necessary so that specified item or system will be complete and operational in every respect.

B. Furnish: Under this Contract, Contractor shall deliver to the site item(s) specified, as well as additional specialized materials and/or accessories necessary for the use and operation of item or items specified.

C. Install: Under this Contract, Contractor shall set in position, connect (including sub-assemblies furnished), and adjust for use. Contractor shall furnish miscellaneous specialty items such as hangers, valves, unions, piping, sheet metal, etc., as obviously necessary for a complete and operating installation.

1.05 DRAWINGS

A. In general, the drawings of the HVAC Systems and Equipment are to scale, however, to determine exact locations of walls and partitions, the Contractor shall consult the Architectural and/or Structural Drawings. Drawings shall not take precedence over field measurements. Plans of piping and ductwork, although shown on scale drawings, are diagrammatic only. They are intended to indicate the size and/or capacity where stipulated, approximate location and/or direction, and approximate general arrangement of one phase of work to another, but not the exact detail or exact arrangement of construction.

B. If it is found before installation of any or all construction phases, that a more convenient, suitable or workable arrangement of any or all phases of the project would result by varying or altering the arrangement indicated on the drawings, the Architect may require any or all Contractors to change the location or arrangement of their work without additional cost to the Owner. Such rearrangement shall be in accordance with directions from the Architect.

C. Where discrepancies are discovered after certain portions or phases of any Contract have been installed, the Architect reserves the right to have any or all Contractors make minor changes in pipe, duct, fixture or equipment locations or arrangements to avoid conflict with other work at no additional cost to the Owner.

D. Because the drawings are to a relatively small scale to show as large a portion as is practical, the fact that only certain features of the system are indicated does not mean that other similar or different features or details will not be required. Contractor shall furnish all incidental labor, materials, or equipment for the systems under his control, so that each system is a complete and operating one unless otherwise specifically stipulated in the detailed body of the Specifications.

E. The Contractor shall be responsible for determining all field measurements before commencing construction, giving due consideration to building design and other equipment to be installed. HVAC equipment not dimensioned on the drawings shall be field located, giving due consideration to the work of other trades. The Contractor shall verify all dimensions before proceeding with the work.

F. Dimensions shall not be scaled from the drawings. If the Contractor discovers any discrepancy between actual measurements and those shown on the drawings which prevents good practice, good arrangement, or which is contrary to the intent of the drawings and specifications, he shall notify the Architect before proceeding with the work.

1.06 SITE INSPECTION

A. Before submitting a proposal for the work contemplated in these specifications and accompanying drawings, each bidder shall examine the site and familiarize themselves with all the existing conditions and limitations, including the extent of demolition, cutting and patching to be done by the Contractor for HVAC Work. No extras will be allowed because of the Contractor's misunderstanding as to the amount of work involved, or his lack of knowledge of any condition in connection with the work.

1.07 CODES AND STANDARDS

A. The entire project shall comply with any and all OSHA, Federal, State and local codes, including, but not limited to State Building Code, National Electrical Code, NFPA 90A (Ventilation Systems), and the State/International Energy Code (insulation).

B. Code requirements shall supersede details shown on the drawings or described in these specifications. Size of all pipe must conform to the requirements of all Codes except where larger sizes are shown on the drawings.

1.08 EQUIPMENT

A. All equipment shall be new and in first-class condition. Equipment shall not be used for purposes other than intended by the manufacturer.

B. Manufacturer's nameplate, name or trademark shall be permanently affixed to all equipment and material furnished under this Specification. Nameplate of Subcontractor or distributor will not be acceptable. Nameplate shall be masked prior to any painting. Remove masking after completion.

C. Equipment specified and furnished shall be of a type and manufacturer that has a local representative and a local replacement and service outlet to give complete coverage on parts and service at all times.

1.09 WARRANTY

A. The Contractor shall be held responsible for any and all defects in equipment and workmanship which appear for one (1) full year after the date of Substantial Completion. All such defects must be repaired or defective equipment promptly replaced by the Contractor at no expense to the Owner.

1.10 INSPECTIONS AND FEES

A. The Contractor shall obtain all permits and licenses required in connection with the work under Division 23. Cost for such shall be paid by the Contractor.

1.11 SUBMITTALS

A. Shop Drawings:
   1. See Division 1 for submittals procedures. This section supplements the requirements of Division 1. In case of differences, the greater requirement applies.
   2. Shop drawings shall be submitted for all major equipment under each Section of this Specification.
   3. Shop drawings must first be checked by the Contractor for capacities and space conformance, and so stamped prior to submittal to the Architect.

B. Operating and Maintenance Manuals:
   1. See Division 1 for submittals procedures. This section supplements the requirements of Division 1. In case of differences, the greater requirement applies.
   2. Manuals must be professionally prepared including printed spine and cover with full table of contents and tabbed indexing. Full size sheets and diagrams shall be folded into special pocket holders. Manuals shall meet the requirements outlined in ASHRAE 2003 Applications Handbook, Chapter 38.
   3. Instructions shall include the following information:
      a. Include full instructions on lubrication, servicing and maintenance scheduling.
      b. Include operating instructions including start up, emergency shut down and start-up, seasonal servicing and start up, etc.
      c. Include owner's manuals for each item of equipment.
      d. Include final certified TAB report.
      e. Include all equipment wiring diagrams.
      f. Include all HVAC control diagrams.
      g. Include all HVAC systems diagrams and operational diagrams.
      h. Include full parts lists and exploded schematic diagrams.
      i. Include full warranty information.
      j. Include full names, addresses, phone numbers, suppliers, service companies, contract numbers and other points of contact/information relative to the job.
   4. Where indicated in the Specifications, the Contractor shall provide the services of a factory trained representative to instruct the Owner's authorized personnel in the operation, control and maintenance of equipment.

C. Record Drawings:
   1. The Contractor shall keep a complete set of all HVAC drawings in the job site office for purposes of showing "As-Built" installation of HVAC systems and equipment.
   2. This set of drawings shall be used for no other purpose. Where any material, equipment or system components are installed different from that shown on the Drawings, such differences shall be clearly and neatly shown on this set of drawings using ink, or indelible pencil. The change notations shall be kept up-to-date on a daily basis. At the completion of the project, the set of drawings shall be turned over to the Architect for approval and delivery to the Owner.

1.12 TEMPORARY UTILITIES

A. Contractor shall refer to Division 1 for temporary water, sewer and heating requirements during construction.

PART 2 - PRODUCTS - NOT USED.

PART 3 - EXECUTION

3.01 WORKMANSHIP

A. Workmanship shall be first-class in every respect. Standard accepted practice in the various trades shall be considered as minimum. The Architect reserves the right to reject any workmanship not in accordance with the specifications, either before or after installation of equipment.

3.02 COORDINATION

A. The Contractor shall coordinate locations and arrangements of his equipment with other Contractors and subcontractors working on the project. Before starting work, the Contractor shall examine the Architectural, Structural and Electrical drawings and specifications, as well as shop and vendor drawings, for all divisions, to ascertain locations, levels, arrangements and dimensions of other work and shall confer and cooperate with all other Contractors or subcontractors to avoid all interferences. He shall also provide Contractors for other trades with information regarding locations, arrangements and dimensions of his equipment.

B. In cases of interferences between various items of equipment or between equipment and building members, if simplified construction is made possible by the relocation of certain equipment, changes in arrangements may be made only if authorized by the Architect.

C. Interferences between the work of different divisions which cannot be resolved by the parties involved shall be submitted to the Architect who shall decide upon final location and arrangement without respect to which work was installed first.

3.03 DEMOLITION AND REMODELING

A. Where cutting and patching is required, each Contractor shall be responsible for his own work.

B. Relocation of existing equipment and piping systems, which of necessity must provide continuous uninterrupted service, shall be accomplished in the least possible time. Work shall be scheduled so as to minimize down time for the respective systems involved. This will require for existing services being revamped and/or relocated, that all interconnecting portions of these systems shall be installed as complete as practicable prior to actual shutdown for final connections.

C. Locate existing piping and make connection where required and/or where shown on the drawings. Do not cut into existing services without first ascertaining that the pipe involved is the desired service. In any area where work performed under Division 23 is the only work involved, restore the area to its original condition upon completion of the work.

D. All existing services and equipment shall be maintained unless otherwise indicated on the drawings.

E. Work that interrupts any service (this includes cutting into existing lines for new connection), shall be performed at times (usually nights or weekends) to cause least interference to the normal operation of the building. Anticipate scheduling work at periods which will result in additional construction costs, such as nights or weekends, and include cost in the proposal.

F. The Owner shall be fully informed in advance of any shut-off which will occur and which will be affected for a specific period of time. Only after the Owner is fully informed and has agreed to the schedule of cut-offs, can the work then proceed accordingly.

G. Provide temporary bracing, shoring, underpinning and support during demolition, cutting, remodeling and related new construction as necessary for the execution of the Work and the protection of persons and property.

H. Provide protective coverings and enclosures necessary to prevent damage to existing work to remain. Protect temporary openings in exterior walls and roofs so as to prevent damage from water and the elements and prevent excessive heat loss from the existing building.

I. Demolish and remove existing construction to be removed. Where new work is to be installed in or adjacent to existing construction or existing work is to be replaced, remove or cut the existing construction to the extent necessary to install or join the new work to the existing construction as necessary to complete the Work of the Project.

J. Refrigerant shall be recovered from all existing A/C systems prior to demolition. Recovered refrigerant shall be bottled in approved containers.

K. Clean demolition areas and remove debris, waste and rubbish from the building at the conclusion of each day's work. Transport debris and rubbish in such a manner as to prevent the spread of dust. Remove debris, waste and rubbish promptly from the site. Do not burn debris, waste and rubbish on the site.

L. Owner shall have first rights to salvage existing equipment not indicated to be reused. All existing materials not designated to be reused or to remain the property of the Owner, shall become the property of the Contractor and shall be removed from the site.

M. Existing materials indicated on the drawings to be reused shall be stored on the site and protected until reuse.

N. Patch existing construction to match. All painting shall comply with the specifications laid out in the General Contractor's portion of the specifications. Examine existing surfaces where existing surfaces are to be patched before proceeding with the work. Report all conditions where existing materials, colors, and finishes cannot be matched to the Architect, and do not proceed until the Architect has issued instructions. Existing construction that has been damaged as a result of the work shall be repaired to an extent and as required to match adjacent undamaged construction.

O. Where existing piping, indicated to remain, penetrates new fire rated partitions, Contractor shall fire seal these penetrations same as for new piping.

P. Where duct and/or piping is removed from existing partitions which are to remain, it is this Contractor's responsibility to patch voids to match existing construction.

3.04 COMMISSIONING

A. The implementation of this process requires participation and cooperation between the A/E, the general contractor, appropriate sub-contractors, the commissioning authority and the Owner. At each phase of the construction process, the Contractor, A/E, the commissioning authority and the Owner shall work together so that the commissioning process is completed in a timely manner.

END OF SECTION

SECTION 23 0593

TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

B. Testing, adjustment, and balancing of hydronic systems.

C. Measurement of final operating condition of HVAC systems.

1.02 REFERENCE STANDARDS

A. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2008.

B. NEBB (TAB) - Procedural Standards for Testing Adjusting and Balancing of Environmental Systems; 2015, Eighth Edition.

C. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2002.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.

1. Prior to commencing work, submit report forms or outlines indicating adjusting, balancing, and equipment data required.
2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.
3. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
4. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
5. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
6. Units of Measure: Report data in both I-P (inch-pound) and SI (metric) units.
7. Include the following on the title page of each report:
    a. Name of Testing, Adjusting, and Balancing Agency.
    b. Address of Testing, Adjusting, and Balancing Agency.
    c. Telephone number of Testing, Adjusting, and Balancing Agency.
    d. Project name.
    e. Project location.
    f. Project Architect.
    g. Project Contractor.
    h. Project altitude.
    i. Report date.

C. Sequence work to commence after completion of systems and schedule completion of work before Substantial Completion of Project.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:

1. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
2. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems.or TAB.
3. SMACNA (TAB).
4. Maintain at least one copy of the standard to be used at project site at all times.

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.

D. TAB Agency Qualifications:
1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
2. Having minimum of three years documented experience.
3. Certified by one of the following:
   a. NEBB, National Environmental Balancing Bureau: www.nebb.org/#sle.
   b. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org/#sle.

E. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.02 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
1. Systems are started and operating in a safe and normal condition.
2. Temperature control systems are installed complete and operable.
3. Proper thermal overload protection is in place for electrical equipment.
4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
5. Duct systems are clean of debris.
6. Fans are rotating correctly.
7. Fire and volume dampers are in place and open.
8. Air coil fins are cleaned and combed.
9. Access doors are closed and duct end caps are in place.
10. Air outlets are installed and connected.
11. Duct system leakage is minimized.
12. Hydronic systems are flushed, filled, and vented.
13. Pumps are rotating correctly.
14. Proper strainer baskets are clean and in place.
15. Service and balance valves are open.

B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.

C. Beginning of work means acceptance of existing conditions.

3.03 PREPARATION

A. Hold a pre-balancing meeting at least one week prior to starting TAB work.
1. Require attendance by all installers whose work will be tested, adjusted, or balanced.

B. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect to facilitate spot checks during testing.

C. Identify locations where additional balancing devices as required and report on deficiency report.

3.04 ADJUSTMENT TOLERANCES

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

B. Hydronic Systems: Adjust to within plus or minus 5 percent of design.

3.05 RECORDING AND ADJUSTING

A. Field Logs: Maintain written logs including:
   1. Running log of events and issues.
   2. Discrepancies, deficient or uncompleted work by others.
   3. Contract interpretation requests.
   4. Lists of completed tests.

B. Ensure recorded data represents actual measured or observed conditions.

C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

D. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

E. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

F. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

G. Check and adjust systems approximately six months after final acceptance and submit report.

3.06 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

F. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

K. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.

L. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure near the building entries.

M. For variable air volume system powered units set volume controller to air flow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.

3.07 WATER SYSTEM PROCEDURE

A. Adjust water systems to provide required or design quantities.

B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gages to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.

C. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.

D. Effect system balance with automatic control valves fully open to heat transfer elements.

E. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.

END OF SECTION

SECTION 23 0713
DUCT INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Duct insulation.

1.02 REFERENCE STANDARDS

A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2017.

B. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2020.

D. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.

E. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.

F. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

C. Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

1.04 QUALITY ASSURANCE

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

1.05 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.06 FIELD CONDITIONS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

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

2.02 GLASS FIBER, FLEXIBLE

A. Manufacturer:
   1. Knauf Insulation: www.knaufinsulation.com.
   2. Johns Manville: www.jm.com.

3. Owens Corning Corporation: www.ocbuildingspec.com.
4. Certain-teed.
5. Substitutions: See Section 01 6000 - Product Requirements.

B. Insulation: ASTM C553; flexible, noncombustible blanket.
1. 'K' value: 0.25 at 75 degrees F, when tested in accordance with ASTM C518.
2. Maximum Service Temperature: 150 degrees F.
3. Maximum Water Vapor Absorption: 5.0 percent by weight.

C. Vapor Barrier Jacket:
1. Kraft paper with glass fiber yarn and bonded to aluminized film.
2. Moisture Vapor Permeability: 0.029 ng/Pa s m (0.02 perm inch), when tested in accordance with ASTM E96/E96M.
3. Secure with pressure sensitive tape.

D. Vapor Barrier Tape:
1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that ducts have been tested before applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Insulated ducts conveying air below ambient temperature:
1. Provide insulation with vapor barrier jackets.
2. Finish with tape and vapor barrier jacket.
3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

END OF SECTION

SECTION 23 0719
HVAC PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Piping insulation.

B. Jackets and accessories.

1.02 REFERENCE STANDARDS

A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2013.

B. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement; 2007 (Reapproved 2013).

C. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2015.

D. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2013).

E. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2020.

F. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2016.

G. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.03 QUALITY ASSURANCE

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

1.04 DELIVERY, STORAGE, AND HANDLING

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

1.05 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

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

2.02 GLASS FIBER

A. Manufacturers:
   1. Knauf Insulation: www.knaufinsulation.com.
   2. Johns Manville Corporation: www.jm.com.
   3. Owens Corning Corp: www.owenscorning.com.
   4. CertainTeed Corporation; : www.certainteed.com.

B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
   1. 'K' Value: ASTM C177, 0.24 at 75 degrees F.
   2. Maximum Service Temperature: 850 degrees F.
   3. Maximum Moisture Absorption: 0.2 percent by volume.

C. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.

D. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

E. Vapor Barrier Lap Adhesive: Compatible with insulation.
   1. Factory applied double pressure sensitive adhesive along longitudinal joints. Joints at insulation sections sealed with butt strips with adhesive factory applied.

F. Outdoor Breather Mastic: Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.
   1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

G. Insulating Cement: ASTM C449.
   1. ASTM C449/C449M.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that piping has been tested before applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Exposed Piping: Provide PVC jacket. Locate insulation and cover seams in least visible locations.

D. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.

E. Glass fiber insulated pipes conveying fluids above ambient temperature.
   1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
   2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

F. Inserts and Shields:
   1. Application: Piping 1-1/2 inches diameter or larger.
   2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
   3. Insert location: Between support shield and piping and under the finish jacket.
   4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
   5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

G. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions.

3.03 SCHEDULE

A. Heating Systems:
   1. Heating Water Supply and Return (Up to 200 degrees):
      a. Interior Piping; Glass Fiber Insulation:
         1) Pipe Size Range: Runouts
            (a) Thickness: 1 inch.
         2) Pipe Size Range: Any size.
            (a) Thickness: 2 inch.

3) Jackets: PVC jacket on exposed piping less than 5 feet above floor and all exposed piping in Gym and Cafeteria.

b. Jackets: Aluminum jacket on exterior piping.

END OF SECTION

SECTION 23 3100
HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Metal ductwork.

1.02 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2019a.

C. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2020.

E. SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual; Sheet Metal and Air Conditioning Contractors' National Association; 2012, 2nd Edition.

F. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005.

G. SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual; 2012, 2nd Edition.

1.03 PERFORMANCE REQUIREMENTS

A. No variation of duct configuration or sizes permitted except by permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate, following SMACNA (LEAK).

C. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.05 FIELD CONDITIONS

A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 PRODUCTS

2.01 MATERIALS

A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G90 coating.

B. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
   1. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
   2. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.

C. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

D. Insulated Flexible Ducts:

1. Black polymer film supported by helically wound spring steel wire; fiberglass insulation; polyethylene vapor barrier film.
    a. Pressure Rating: 4 inches WG positive and 0.5 inches WG negative.
    b. Maximum Velocity: 4000 fpm.
    c. Temperature Range: -20 degrees F to 175 degrees F.

E. Ducts: Galvanized steel, unless otherwise indicated.

F. Low Pressure Supply (System with Cooling Coils): 1 inch w.g. pressure class, galvanized steel.

G. Return and Relief: 1 inch w.g. pressure class, galvanized steel.

H. General Exhaust: 1 inch w.g. pressure class, galvanized steel.

2.02 DUCTWORK FABRICATION

A. Fabricate and support in accordance with SMACNA (DCS) and as indicated.

B. Provide duct material, gauges, reinforcing, and sealing for operating pressures indicated.

C. T's, bends, and elbows: Construct according to SMACNA (DCS).

D. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

E. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA (DCS).

F. Provide standard 45 degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.

2.03 MANUFACTURED DUCTWORK AND FITTINGS

A. Manufacture in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gages,reinforcing, and sealing for operating pressures indicated.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install, support, and seal ducts in accordance with SMACNA (DCS).

B. Penetrations through full height walls shall be caulked completely through the penetration with an acoustical sealant.

C. Duct sizes indicated are outside dimensions.

D. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pitot tube openings where required for testing of systems, complete with plug against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

E. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

F. Connect flexible ducts to metal ducts with draw bands.

G. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

END OF SECTION

SECTION 23 3300
AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Backdraft dampers.

B. Combination fire and smoke dampers.

C. Duct access doors.

D. Fire dampers.

E. Flexible duct connections.

F. Volume control dampers.

1.02 REFERENCE STANDARDS

A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.

B. NFPA 92 - Standard for Smoke Control Systems; 2015.

C. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005.

D. UL 555 - Standard for Fire Dampers; Current Edition, Including All Revisions.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Manufacturer's Installation Instructions: Provide instructions for fire dampers and combination fire and smoke dampers.

1.04 PROJECT RECORD DOCUMENTS

A. Record actual locations of access doors and test holes.

1.05 QUALITY ASSURANCE

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

1.06 DELIVERY, STORAGE, AND HANDLING

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

PART 2 PRODUCTS

2.01 BACKDRAFT DAMPERS

A. Multi-Blade, Parallel Action Gravity Balanced Backdraft Dampers: Galvanized steel, with center pivoted blades of maximum 6 inch width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

2.02 COMBINATION FIRE AND SMOKE DAMPERS

A. Manufacturers:
   1. Greenheck.
   2. Prefco.
   3. Ruskin Company: www.ruskin.com..
   4. SafeAire.

B. Provide factory sleeve and collar for each damper.

C. Multiple Blade Dampers: Fabricate with 16 gage galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, stainless steel jamb seals, 1/8 x 1/2 inch plated steel concealed linkage, stainless steel closure spring, blade stops, and lock, and 1/2 inch actuator shaft.

D. Heat-Actuated Temperature Release Device:
   1. Control close and lock damper during test, smoke detection, power failure, or fire conditions through actuator closure spring. At no time shall actuator disengage from damper blades.
   2. Allow damper to be automatically and remotely resettable after test, smoke detection, or power failure conditions. After exposure to high temperature or fire, inspect damper before reset to ensure proper operation.
   3. Controlled closure and locking of damper to occur in 3 to 15 seconds to allow duct pressure to equalize. Instantaneous closure is not acceptable.
   4. Pneumatic PFL with pneumatic actuators.
   5. Release Temperatures: 165 degrees F .

2.03 DUCT ACCESS DOORS

A. Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ducts, install minimum 1 inch thick insulation with sheet metal cover.

2.04 FIRE DAMPERS

A. Manufacturers:
   1. Greenheck.
   2. Prefco.
   3. Ruskin Manufacturing.
   4. SafeAire.

B. Fabricate in accordance with NFPA 90A and UL 555, and as indicated.

C. Ceiling Dampers: Galvanized steel, 22 gage frame and 16 gage flap, two layers 0.125 inch ceramic fiber on top side and one layer on bottom side for round flaps, with locking clip.

D. Curtain Type Dampers: Galvanized steel with interlocking blades. Provide stainless steel closure springs and latches for horizontal installations. Configure with blades out of air stream except for 1.0 inch pressure class ducts up to 12 inches in height.

2.05 FLEXIBLE DUCT CONNECTIONS

A. Fabricate in accordance with SMACNA (DCS) and as indicated.

B. Flexible Duct Connections: Fabric crimped into metal edging strip.
   1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd.
      a. Net Fabric Width: Approximately 2 inches wide.
   2. Metal: 3 inches wide, 24 gage, 0.0239 inch thick galvanized steel.

2.06 VOLUME CONTROL DAMPERS

A. Fabricate in accordance with SMACNA (DCS) and as indicated.

B. Single Blade Dampers: Fabricate for duct sizes up to 6 by 30 inch.
   1. Blade: 24 gage, 0.0239 inch, minimum.

C. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 8 by 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
   1. Blade: 18 gage, 0.0478 inch, minimum.

D. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon, thermoplastic elastomer, or sintered bronze bearings.

E. Quadrants:
   1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.

2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
3. Where rod lengths exceed 30 inches provide regulator at both ends.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). Refer to Section 23 3100 for duct construction and pressure class.

B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated. Provide 4 x 4 inch for balancing dampers only. Review locations prior to fabrication.

D. Provide duct access doors for inspection and cleaning before and after coils,

E. Provide fire dampers, combination fire and smoke dampers, and smoke dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by Authorities Having Jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.

F. Install smoke dampers and combination smoke and fire dampers in accordance with NFPA 92.

G. Demonstrate re-setting of fire dampers to Owner's representative.

H. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.

I. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.

END OF SECTION

SECTION 23 8200

CONVECTION HEATING AND COOLING UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Finned tube radiation.

1.02 REFERENCE STANDARDS

A. AHRI Directory of Certified Product Performance - Air-Conditioning, Heating, and Refrigeration Institute (AHRI); current edition at www.ahrinet.org.

B. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide typical catalog of information including arrangements.

1.04 QUALITY ASSURANCE

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

PART 2 PRODUCTS

2.01 HYDRONIC FINNED TUBE RADIATION

A. Required Directory Listing: AHRI Directory of Certified Product Performance - Air-Conditioning, Heating, and Refrigeration Institute (AHRI); current edition at www.ahrinet.org.

B. Element Hangers: Quiet operating, ball bearing cradle type providing unrestricted longitudinal movement, on enclosure brackets.

C. Enclosures: 18 gage, 0.0478 inch sheet steel up to 18 inches in height, 16 gage, 0.0598 inch sheet steel over 18 inches in height or aluminum as detailed, with easily jointed components for wall to wall installation.

D. Finish: Factory applied baked enamel of color as selected.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are suitable for installation.

3.02 INSTALLATION

A. Install in accordance with manufacturer's recommendations.

B. Install equipment exposed to finished areas after walls and ceilings are finished and painted.

C. Cabinet Unit Heaters:
   1. Coordinate to ensure correct recess size for recessed units.

D. Units with Hydronic Coils:
   1. Provide with shut-off valve on supply and return piping and tamper-proof, balancing valve with memory stop on return piping.
   2. If not easily accessible, extend air vent to exterior surface of cabinet for ease of servicing.

E. Air Coils:
   1. Install in ducts and casings in accordance with SMACNA (DCS).
      a. Support coil sections independent of piping on steel channel or double angle frames and secure to casing.

3.03 PROTECTION

A. Provide finished cabinet units with protective covers during the balance of construction.

END OF SECTION

SECTION 26 0500

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. The work included in this section of the specifications consists of furnishing labor, equipment, supplies, and materials, unless otherwise specified, and in performing operations necessary for the installation of electrical work as listed in the Instruction to Bidders and as required by these specifications and shown on the drawings, subject to the terms and conditions of the contract. The work shall also include the completion of details of electrical work not mentioned or shown which are necessary for the successful operation of electrical systems described on the drawings or required by these specifications.

B. Section Includes:
   1. Definitions
   2. Quality Assurance
   3. Coordination
   4. Permit, Fees, and Inspections
   5. Insurance
   6. Substitutions
   7. Shop Drawings
   8. Payment Request Breakdown
   9. Project Record Drawings
   10. Operating and Maintenance Manuals
   11. Basic Requirements for Utility Service
   12. Project Conditions
   13. Guarantee/Warranty
   14. Common requirements for Electrical Installation
   15. Penetration Firestopping
   16. Excavation and backfill
   17. Refinishing and Touchup painting
   18. Cleaning and Protection
   19. Equipment Furnishing by Owner
   20. Interruption of Existing Electric Service
   21. Building Structure Penetrations
   22. Final Tests and Adjustments
   23. Instruction of Owners Employees
   24. Electrical equipment coordination and installation.
   25. Sleeves for raceways and cables.
   26. Sleeve seals.
   27. Grout.
   28. Common electrical installation requirements.

1.03 DEFINITIONS

A. Basic Contract definitions are as follows:
   1. Provide: The term "provide" means "to furnish and install, ready for the intended use and in complete operating condition."
   2. Furnish: The term "furnish" means "to purchase devices and/or equipment and hand over to another entity for installation"

3. Install: The term "install" is used to describe operations at project site including the actual "unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations."
4. Directed: Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean "directed by the Engineer," "requested by the Engineer," and similar phrases.
5. Approve: The term "approved," where used in conjunction with the Engineer's action on the Contractor's submittals, applications and requests, is limited to the Engineer's duties and responsibilities as stated in the Conditions of the Contracts.
6. Indicated: The term "indicated" refers to graphic representations, notes or schedules on the Drawings, or other Paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Where terms such as "shown," "noted," "scheduled and "specified" are used, it is to help the reader locate the reference; no limitation on location is intended.
7. Contractor: The term "Contractor" shall carry the same meaning as "Electrical Contractor" or “Division 26 Contractor”.
8. Or Equal: The term "Or equal" shall carry the same meaning as "approved as equal by the Engineer"
9. Owner: All references here-in and on drawings to “Owner” shall be the same as “Duluth Transit Authority”.

B. Product specific to this section definitions:
1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

1.04 SUBMITTALS

A. Product Data: For sleeve seals.

1.05 QUALITY ASSURANCE

A. Drawings and Measurements
1. The drawings are not intended to be scaled for roughing-in measurements or to serve as shop drawings. The Contractor shall consult the architectural, structural, mechanical, or equipment drawings for dimensions noted, obstructions and location of equipment of other trades.
2. Outlet devices, switches, panels, cabinets, fixtures and special equipment are shown on the drawings only in a schematic manner and not necessarily in their specific location. The Contractor shall be responsible for exact locations of the outlets to form a functional and aesthetic installation either by careful review of all architectural elevations, tile patterns, surface finishes, and equipment arrangements or by consultation with the Engineers and/or other trades involved.

B. Ordinances and Codes
1. All work shall be executed in accordance with the current edition of the City Electrical Ordinances, State Electrical Laws and Statutes and National Electrical Code (NEC), and be subject to the inspection of these departments. All fees, permits, licenses, etc., necessary in order to complete the work of this section shall be paid by this Contractor.

C. Personnel
1. All Electrical workers on this project shall be thoroughly knowledgeable of all applicable codes related to all electrical systems for this project. All installations shall be performed by skilled electrician tradesmen fully aware of the latest techniques, practices, and standards of the industry. Haphazard or poor installation practice as determined by the Architect or Engineer will be cause for rejection of work.

D. Workmanship

1. The installation work included in this specification shall be performed in a neat workmanlike manner. Only the best quality workmanship will be accepted. All exposed parts of the electrical wiring systems such as exposed conduits, flush plates, cabinet trim, fixtures, etc., shall be square and true with the building construction.

E. Guarantee
   1. This Contractor shall assume responsibility for any defects which may develop in any part of his work caused by faulty workmanship, material or equipment, and agrees to replace, repair, or alter, at their expense, any such faulty workmanship, material or equipment that has been brought to their attention during a period of one year from the date of substantial completion. Acceptance of the work shall not waive this guarantee.

F. Materials and Equipment
   1. All materials and equipment shall be new and of best quality, of the type best suited for the purpose intended. All items shall be furnished by the Manufacturer's Authorized Supplier. All electrical materials used in this work shall be listed by the Underwriter's Laboratories, Inc., where testing is provided and shall bear their label.
   2. Recycle all materials as required by Division 0 and 1 specifications and additional sections of this Division.

1.06 COORDINATION

A. All drawings, specifications and documents for this project shall be taken as a whole. Prior to installation, the Contractor shall be familiar with this project by carefully reviewing and comparing all documents that pertain to this project.

B. In preparation of the contract documents, a reasonable effort has been made to provide layouts and connections based on selected and specified manufacturer's equipment. Since physical space, electrical connections, equipment arrangements and other requirements may vary according to each manufacturer, the final responsibility for connections, initial access and proper fit is the responsibility of this Contractor.

C. Coordinate arrangement, mounting, and support of electrical equipment:
   1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
   2. To provide for ease of disconnecting the equipment with minimum interference to other installations, and maintain working clearances per the NEC or additional as required by these documents.
   3. To allow right of way for piping and conduit installed at required slope.
   4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

D. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations.

E. Coordinate installation locations of all equipment with other trades to verify proper fit and function. Facilitate a pre-construction planning meeting for all major sub contractors (Divisions 26 thru 28) to coordinate actual equipment with installation locations. Provide meeting minutes as a part of the shop drawing review process.

F. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

G. Provide access panels and doors for electrical items that are behind finished surfaces or otherwise concealed.

H. Coordinate sleeve selection and application with selection and application of firestopping that is existing

I. Prior to roughing in for electrical equipment furnished by others, verify the voltage and current characteristics and control connections of this equipment. Notify the Engineer where equipment connection requirements do not match the provisions indicated on the documents.

J. Where electrical identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.

K. Utility use charges
   1. Electric power from Owner's existing system is available for use without metering and without payment of use charges.
   2. Coordinate all requirements with serving utility and/or service providers prior to bid. All utilities (power, telephone, CATV, etc) must be maintained at all times unless approved by Owner. Provide temporary connections equivalent to existing services. Electrical contractor is responsible for all temporary installation costs and new installation costs.

L. Permit and Inspection Fees
   1. Secure regular inspections as required by State and local regulations. Pay charges by regulating agencies for Drawings, Specifications, review of Drawings and Specifications, and the inspections of installations.
   2. Electrical contractor shall pay all fees for permits, licensing, and inspections applicable to the work of Division 26.

1.07 SUBMITTALS

A. General: Follow the procedures specified in Division 1 Sections.

B. Substitutions:
   1. Submission: Submit a separate request for each product, supported with descriptions, drawings and samples as appropriate, including:
      a. Comparison of the qualities of the proposed substitution with that specified. Standard features and options of the proposed substitution shall be clearly identified on the submittal.
      b. Changes required in other elements of the work because of the substitution.
      c. Availability of maintenance service, and source of replacement materials.
   2. Substitution request constitutes a representation that bidder submitting request:
      a. Has investigated the proposed product and determined that it is equal to or superior in all respects to that specified.
      b. Will provide the same warranties or bonds for the substitution as for the product specified.
      c. Will coordinate the installation of an accepted substitution into the Work, and make such other changes as may be required to make the Work complete in all respects.
      d. Waives all claims for additional costs, under his responsibility which may subsequently become apparent.
   3. Engineer Review: The Engineer will review requests for substitutions with reasonable promptness to judge the acceptability of the proposed substitution, and notify bidders by addendum the decision to accept the requested substitution.
   4. Late Request for Substitutions: Requests for substitution received after bidding will not be considered except in such cases where it is necessary to make a substitution due to strikes, lockouts, bankruptcy, discontinuing of a product, etc. Requests for such substitutions of materials after award of contract shall be made in writing to Engineer and shall be made within ten days of date that Contractor ascertains he cannot obtain material or equipment specified.
   5. Engineer's Acceptance: Engineer's acceptance of a substituted item applies only to the general quality and arrangement of the items substituted. Substituted items are still subject to the shop drawing review process.

C. Shop Drawings:

1. Before ordering any equipment, stamp with approval, and submit to the Engineer the number of copies required for the contractor's use, plus (1) one copy to be retained by the Engineer.
2. The review of shop drawings by the Architect/Engineer shall not constitute agreement of any deviations from the plans and specifications and shall not relieve the Contractor from responsibility for errors or omissions.
3. Shop drawings shall be in electronic copy format as follows:
    a. A digital, text searchable copy of shop drawings (Adobe Acrobat Portable Document Format - *.pdf – is preferred content format).
    b. Refer to drawings for the additional required equipment that is to be submitted as part of the shop drawing submittals.

D. Payment Request Breakdown:
1. For the purpose of establishing a schedule of values to be used for Application and Certification for Payments as defined in the General Conditions of the specifications, the items of electrical work shall be broken down per the following schedule. Each item of schedule shall contain its proper share of overhead and profit and shall be broken into a labor and material figure.
    a. General Conditions
    b. Conduits - 1" and larger
    c. Conduits - 1/2" and 3/4"
    d. Conductors - #6 and larger
    e. Conductors - #8 and smaller
    f. Interior lighting fixtures
    g. Exterior lighting fixtures
    h. Wiring devices
    i. Outlet boxes, junction boxes, pull boxes
    j. Lighting control system
    k. Motor disconnects, starters, controls, etc.
    l. Miscellaneous

E. Project Record Documents:
1. As work progresses: Record changes or deviations from the contract drawings as follows:
    a. Record location and elevation of underground conduits and direct burial wiring.
    b. Record as-built changes for electrical work within the building that occur during the progress of construction and before the work is concealed. Record shall include such changes as:
    c. Relocation of devices to avoid obstacles.
    d. Routing of conduit from outlet to outlet.
    e. Routing of conduit under floor, overhead, in walls or exposed.
    f. Combining of circuits into common conduit.
    g. Sizes of conduits and conductors.
    h. Revisions to circuit breaker quantity or arrangement in panelboards.

F. Location: The record drawings shall be maintained at the job site and be subject to review by the Owner or Engineer during the construction period. Prints for this purpose may be obtained from the Architect at cost. This record keeping requirement shall not be construed as authorization for the Contractor to make changes in the layout without definite instructions by the Architect/Engineer in each case.

G. Submission: Upon completion of the work, a set of drawings showing changes as noted on the record set of prints shall be submitted to the Engineer.

H. Operating and Maintenance Manuals:
1. Submittal: At the completion of the contract submit to the Engineer two sets of operating and maintenance manuals including parts lists bound into hard covered manuals for the

electrical equipment. Each manual to include an electronic data disk of the entire operating and maintenance manual with folder structure and naming to match tabs in the manual. Manuals shall be labeled with the local supplier's name and address. Information not definitely applying to these particular pieces of equipment shall be crossed out or deleted from the submission. Information shall be included for equipment for which shop drawings have been provided.

2. Content:
    a. Approved shop drawings. Approved shop drawings or product data sheets alone are not to be considered as acceptable maintenance material. Most items of equipment are shipped with installation/maintenance sheets included in the shipping package which shall also be included into the maintenance manual.
    b. Special warranties.
    c. Programming: Instructions for programmable systems.
    d. Hazardous Materials: Disposal Certificates.

1.08 PROJECT CONDITIONS

A. Exterior Environmental Conditions: Electrical systems shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:
    1. Ambient Temperature: Temperature ranges at the Project location as determined by the U.S. Weather Bureau.
    2. Altitude: Elevation of the Project locations.

B. Interior Environmental Conditions: Electrical systems shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:
    1. Ambient Temperature: 72 to 75 deg F (conditioned spaces), 55 deg F to ambient (unconditioned spaces).
    2. Relative Humidity: 0 to 95 percent.
    3. Altitude: Elevation of the Project location.

1.09 GUARANTEE/WARRARNTY

A. The electrical system installed under this contract shall be left in proper working order. Replace, without additional charge, new work or material which develops defects from ordinary use within one year unless a longer period is specified elsewhere, from substantial completion, except materials not furnished by the Contractor, or unless specified otherwise in Sub-Sections as Special Warranties.

B. New materials and equipment shall be guaranteed against defects in composition, design or workmanship. Guarantee certificates shall be furnished on special equipment, as indicated.

PART 2 PRODUCTS

2.01 SLEEVES FOR RACEWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel.
    1. Minimum Metal Thickness:
        a. For sleeve cross-section rectangle perimeter less than 50 inches and no side more than 16 inches, thickness shall be 0.052 inch.
        b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches and 1 or more sides equal to, or more than, 16 inches, thickness shall be 0.138 inch.

2.02 SLEEVE SEALS

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 Co.
      d. Pipeline Seal and Insulator, Inc.
   2. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
   3. Pressure Plates: Carbon steel Include two for each sealing element.
   4. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.03 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.04 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 250 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

3.01 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

B. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

D. Right of Way: Give to piping systems installed at a required slope.

E. Securely fasten and support electrical components and devices.

F. All devices installed in the ceiling grid shall be centered on the tile. Corridor devices shall be mounted in a straight line.

G. Make electrical connections in accordance with equipment manufacturer's instructions.

H. All wiring shall be installed in conduit unless otherwise noted and of a type allowed the contract documents. All conduits shall be concealed unless otherwise noted.

I. In general, the electrical loads shall be circuited as shown on the Drawings. If the Division 26 contractor modifies the circuiting and can meet all the requirements of the contract documents then it shall be allowed to be different from that shown. All modifications shall be recorded on the as-built drawings.

J. Conduit routing is not shown on the Drawings. It is the Contractor's responsibility to provide required wire count and conduit sizing for a complete and functional system that meets all the requirements of the Division 26 contract documents.

K. Review all contract documents for equipment and devices that require electrical connections. Coordinate connections with all trades, review shop drawings to verify connection requirements (voltage, amperage, phase, location, etc.), and verify any. Special electrical connection requirements.

L. Motor Phase Rotation: Verify proper motor rotation by "bumping" the motor. Coordinate this test with Divisions 21, 22, 23, and 26. Modify circuiting if phase rotation is not correct.

3.02 EXISTING CONDITIONS

A. Drawing Representations: Conduits, lights, circuiting, devices, speakers, etc., shown on the drawings as existing are based on existing plans and may not be installed as originally shown. A field survey was conducted to verify the general accuracy of the existing plans. However, no attempt has been made to find the changes which occur in concealed areas such as above inaccessible ceilings and in walls. Verify the accuracy of the "Existing Conditions" as shown on the drawings as the demolition work progresses. Perform modifications and additions as necessary to correct for these hidden conditions and allow for the completion of the new work.

3.03 INTERRUPTION OF EXISTING ELECTRIC SERVICE

A. The existing building will be in use during construction. Schedule and carry out the Work in such a manner as to cause the Owner a minimum of inconvenience due to service interruption. Temporary services (feeder, branch circuit and signal systems) shall be installed if one area or phase of construction disrupts service to another area of the building(s) or if equipment, conduits, or feeders have to be relocated to allow construction to progress. Service interruptions shall be confined to the smallest area possible at any one time and interruptions shall be scheduled in advance with the Owner's site representative. All interruptions shall be conducted and shall be limited to after hours (9:00 pm – 6:00am) and weekends, or as directed by the Owner. After service has been restored following an interruption, inspect areas affected by the interruption and be responsible for returning automatically controlled equipment to the same operating condition which existed prior to the interruption.

B. Notify the Owner a minimum of 5 working days prior to service interruption.

3.04 TEMPORARY UTILITY INSTALLATION

A. Electric Power Service: Provide electric power service and distribution system of size, capacity and power characteristics as directed by the Construction Manager.
   1. Telephone and Internet Services:
      a. Provide telephone & internet lines to each construction trailer as directed by the Construction Manager.

3.05 UTILITY OPERATION, TERMINATION, AND REMOVAL

A. Maintenance: Maintain facilities in good operating condition until removal.
   1. 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. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
      a. Materials and facilities that constitute temporary facilities are property of Contractor.

b. At Substantial Completion, clean and renovate permanent facilities used during construction period.

3.06 DEMOLITION RESPONSIBILITIES

A. Resupport or Removal: For electrical equipment to be demolished; remove accessible wiring including conduit, junction boxes, hangers and supports for feeders conduits, branch circuits from panelboards to electrical devices such as light fixtures, receptacles, switches, floor outlets, special outlets and equipment, etc., indicated to be removed. Existing conduit, boxes, cable, etc. indicated to remain which are presently being supported from existing ceilings or walls to be removed, shall be temporarily supported to building structure then reinstalled in new ceilings or walls.

B. Raceway System Rework: Rework the existing raceway system such that upon completion of the remodeling, no junction boxes are located in inaccessible locations. This includes existing junction boxes that may be rendered inaccessible due to new piping or ductwork installation. Coordinate with other trades in this effort. Provide additional conduit and connections as required.

C. Protect existing electrical equipment and installations indicated to remain. If damaged or disturbed in the course of the Work, remove damaged portions and install new products of equal capacity, quality, and functionality.

D. Patching: Where conduits are stubbed out of a surface not being removed for new construction, such as a floor slab or poured concrete column or wall, these conduits must be cut back to a point where patching can adequately be performed.

E. Coordinate with Owner: Demolition work shall be coordinated with the Owner. Should questions arise regarding the removal of a conduit and/or wiring, (i.e. Is it energized? Does it serve a load in an area not be remodeled?), confer with the Owner before such wiring or conduit is actually demolished.

F. Salvaged, Reused and Reinstalled equipment and devices: Carefully disconnect and remove items to be salvaged, reused or reinstalled. Any questions regarding the quality and reusability of an item shall be brought to the attention of the Engineer prior to removal. Items shall be properly stored in a manner causing no additional damage to the item. Prior to reinstalling, clean and test item. Upon completion, the item shall be in equivalent condition as prior to its removal. Items damaged due to improper handling and storage by the Contractor shall be replaced with new items of the same type and quality as the original item. Reinstalled light fixtures shall be relamped with new lamps. Non-functioning ballasts shall be replaced with new ballasts. Lamps and ballasts shall be guaranteed as new items. Salvaged items to be turned over to the Owner as described in this specification section and on plans.

G. Demolition equipment and devices: Existing equipment, devices, and light fixtures not indicated for reuse or salvage shall [become the property of this Contractor, unless indicated otherwise, and disposed of properly.
   1. Light fixtures scheduled for removal on this project may contain PCB impregnated ballasts. Remove PCB ballasts from light fixtures and place ballasts in hazardous waste disposal containers. Properly dispose of the ballasts with a registered hazardous materials disposal contractor.
   2. Fluorescent and HID lamps removed from light fixtures shall be placed in containers, and properly disposed of with a registered disposal contractor.

H. Wiring Devices: Disconnect and remove wiring devices and replace with devices and coverplates as shown on the drawings or as specified in Division 26 "Wiring Devices".

I. Low Voltage Systems: Existing communication systems including must remain intact and operating. Should portions of systems require relocation due to demolition, coordinate this move with the Owner before disconnection. Should portions of the fire alarm system require

removal or relocation, contact the fire alarm monitoring company and the Owner before initiating any work on the system.

J. Accessible Work: Remove exposed electrical equipment and installations, indicated to be demolished, in their entirety. Remove all unused cabling not labeled for future use.

K. Abandoned Work: Cut and remove buried raceway and wiring, indicated to be abandoned in place, 2 inches (50 mm) below the surface of adjacent construction. Cap raceways and patch surface to match existing finish.

L. Remove demolished material from Project site. Recycle all materials per Construction Waste Management Specification 01524.

M. Remove, store, clean, reinstall, reconnect, and make operational components indicated for relocation.

N. Contractor shall visit existing building before submitting bid and become familiar with existing conditions.

O. In general, wiring in existing building shall remain as is except as noted on drawings or specified elsewhere. When existing walls, ceilings, floors, electrical panels, light fixtures, switches or other outlets are removed, Contractor shall extend existing circuiting, if required, install junction boxes in walls, ceilings or floors, if required, to continue circuiting; remove all unused wire; remove all unused conduit where accessible; and install new plates with blank gangs as required on existing outlet boxes.

P. Added loads to existing circuiting shall be balanced between phases. On existing panelboards where circuitry is changed, this Contractor shall furnish a revised, typed panel directory.

Q. Contractor shall assume in his bid that all existing equipment and fixtures noted to be reused are in good working condition and can be installed without any repairs. If certain items are found to be in need of repair or in unusable condition, Contractor shall notify the A/E for decision; however, Contractor shall be responsible for any damage caused by him to equipment in removal or handling.

R. Fixtures and other equipment removed and to be re-used shall be cleaned before reinstallation. New lamps shall be provided for all fixtures that are contained within the project scope of work and not specifically called out to be replaced.

S. Any existing switches or receptacles that are relocated shall be replaced with new device.

T. Existing equipment removed and not re-used, at owner’s option, be returned to owner. If owner does not wish to keep the items, they shall become the Contractor's property and be removed from the site, unless otherwise specified or shown.

U. The Owner will be occupying the existing building during construction. Contractor shall provide any temporary connections necessary to maintain services to the existing service. Provide advance notice of minimum 5 working days to the Owner of any temporary service outages. Advance notice shall be in writing with copies to the A/E.

V. Demolition shown on plans is based on information shown on Owner’s existing plans and an on-site review of the facility. Quantities, types, and locations of items shown are believed to be accurate. However, this contractor shall be responsible for removing and/or relocating electrical equipment as required to accommodate remodeling.

W. In general, Contractor shall assume that all work which involves a service outage to areas occupied by the Owner or other building tenants shall be performed on an overtime basis. Work shall continue until service is restored.

X. Provide generator backup for any downtime.

3.07 BUILDING STRUCTURE PENETRATIONS

A. Where existing or temporary raceway systems are being demolished, which leave openings in the existing building structure, the building structure shall be patched to match the existing construction and maintain the existing building fire ratings.

3.08 CUTTING AND PATCHING

A. Provide cutting and patching in conformance the following 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
   2. 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. Other construction elements include but are not limited to the following:
      a. Water, moisture, or vapor barriers.
      b. Membranes and flashings.
      c. Exterior curtain-wall construction.
      d. Sprayed fire-resistive material.
      e. Equipment supports.
      f. Piping, ductwork, vessels, and equipment.
      g. Noise- and vibration-control elements and systems.
   3. 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. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces required to permit electrical installations. Perform cutting by skilled mechanics of trades involved. Any cutting or drilling shall not affect structural integrity. Contractor shall contact A/E prior to drilling through any structural beam. No such cutting or drilling process shall endanger the structure integrity of the building.

C. Repair and refinish disturbed finish materials and other surfaces to match adjacent undisturbed surfaces. Install new fireproofing where existing firestopping has been disturbed. Repair and refinish materials and other surfaces by skilled mechanics of trades involved.

D. 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.

E. 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.

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

G. 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.

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

I. 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. 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.
2. 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.
3. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
4. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

J. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.09 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls, before concrete is poured in place.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

E. Cut sleeves to length for mounting flush with both surfaces of walls.

F. Extend sleeves installed in floors 2 inches above finished floor level.

G. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable, unless indicated otherwise.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry

1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants.".

J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."

K. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using cast-iron 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.

M. Underground, Exterior-Wall Penetrations: Install Schedule 80 PVC rigid pipe sleeves. Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

3.10 SLEEVE-SEAL INSTALLATION

A. Install to seal exterior wall penetrations.

B. Use 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.

3.11 PENETRATION FIRESTOPPING

A. General: All devices/equipment in fire rated ceiling spaces and walls shall be installed in such a manner as to retain fire rating as required. All penetrations of fire rated floors or walls shall be protected by materials and installation details that conform to Underwriter Laboratories Listings for through penetration fire stop systems.

B. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly.

C. Additional specialty fire stopping devices are called out in other portions of these documents, specific to the systems that they serve. Refer to these sections to provide all required firestopping materials as called out herein.

D. General Requirements:
   1. Provide penetration fire stopping 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 fire stopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
   2. Penetrations in Fire-Resistance-Rated Walls: Provide penetration fire stopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
      a. Fire-resistance-rated walls include fire walls, fire-barrier walls, smoke-barrier walls, and fire partitions.
      b. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
   3. Penetrations in Horizontal Assemblies: Provide penetration fire stopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).

a. Horizontal assemblies include floors, floor/ceiling assemblies, and ceiling membranes of roof/ceiling assemblies.
b. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.T-rating in subparagraph below indicates resistance to excessive thermal transmission.
c. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.

4. Penetrations in Smoke Barriers: Provide penetration fire stopping with ratings determined per UL 1479.
5. Accessories: Provide components for each penetration fire stopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration fire stopping manufacturer and approved by qualified testing and inspecting agency for fire stopping indicated.
   a. Permanent forming/damming/backing materials, including the following:
      1) Slag-wool-fiber or rock-wool-fiber insulation.
      2) Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
      3) Fire-rated form board.
      4) Fillers for sealants.
   b. Temporary forming materials.
   c. Substrate primers.
   d. Collars.
   e. Steel sleeves.

E. Fill Materials:
1. 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.
2. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.
3. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
4. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.
5. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
6. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
7. 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.
8. 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.
9. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
10. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
    a. 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.

F. Mixing:
   1. For those products requiring mixing before application, comply with penetration fire stopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

G. Installation:
   1. General: Install penetration fire stopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
   2. 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.
      a. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.
   3. Install fill materials for fire stopping by proven techniques to produce the following results:
      a. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
      b. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
   4. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.12 REFINISHING AND TOUCHUP PAINTING

A. Refinish and touch up paint:
   1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
   2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
   3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
   4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.
   5. Paint exposed conduits to match painted surfaces.

3.13 CLEANING AND PROTECTION

A. Progress Cleaning:
   1. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
      a. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
      b. 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.
      c. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
         1) Use containers intended for holding waste materials of type to be stored.
      d. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
   2. Site: Maintain Project site free of waste materials and debris.
   3. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
      a. Remove liquid spills promptly.
      b. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

4. 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.
5. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
6. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
7. 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 Division 01 Sections.
8. 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.
9. 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.
10. 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.

B. Final Cleaning:
1. Thoroughly clean electrical materials, equipment and apparatus to be free of dust, dirt, rust, and foreign materials before acceptance at Substantial Completion.
2. Clean electrical materials in conformance with manufacturer's instructions.
3. Clean panelboards, switchboards, motor controls, etc. Take special care to remove dirt, mortar, wire scraps, etc., from equipment interiors.
4. Clean accessible elements of disconnecting and protective devices of equipment, coils of dry type transformers, etc. with compressed air (less than 15 psi) and vacuum clean enclosure prior to being energized.
5. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.
6. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

3.14 FINAL TESTS AND ADJUSTMENTS

A. Provide personnel for initial start-up and operation of the electrical equipment and for a trial run of the equipment to demonstrate that the equipment and associated systems are properly installed and operating as intended before the date of substantial completion.

B. Upon completion, subject the work to such tests as are required under industry standards and/or specified herein. Acceptance of the work by Owner shall be contingent upon satisfactory completion of these tests.

C. Subject the work to a careful and thorough visual inspection to detect erroneous or loose connections, damaged components, presence of foreign objects or materials, poor workmanship, incorrect ratings of overcurrent protective devices, or other abnormal conditions.

D. Perform tests to demonstrate proper functioning of lighting equipment, controls, proper rotation, etc. Proper operation of permanently connected meters and metering equipment shall be demonstrated, and the accuracy thereof established to a reasonable degree.

E. Overcurrent protective devices shall be properly coordinated, and as the equipment is put into service, necessary final adjustments shall be made to equipment within the scope of work under this contract to make the electrical system operative throughout.

F. Should any operating condition be encountered which would require abnormal or unsafe settings of protective devices, this fact shall be brought to the attention of the Engineer immediately. Tests shall be recorded and the reports submitted to the Engineer.

G. Perform specific testing as may be required to comply with special installation requirements of the National Fire Protection Association (NFPA). Reporting of these tests shall be submitted to the Engineer and to Authority Having Jurisdiction as defined by the code.

3.15 INSTRUCTION OF OWNERS EMPLOYEES

A. Provide the services of competent instructors, who will give full instructions in the care, adjustment, and operation of parts of the electrical system and equipment to the Owner's employees who are to have charge of the equipment.

B. Each instructor shall be thoroughly familiar with parts of the installation on which he is to give instructions and shall have full knowledge of the operating theory and practical operation-maintenance work. Factory trained instructors shall be employed wherever they are available.

C. Instructions shall be given during the regular work week after the building has been accepted and turned over to the Owner for regular operation. In addition to the time indicated in other Division 26 sections, provide 8 hours of instructions for general systems.

D. The instructions shall be given within three months after the work has been accepted and turned over to the Owner at a time mutually agreed on with the Owner.

END OF SECTION

SECTION 26 0505
SELECTIVE DEMOLITION FOR ELECTRICAL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical demolition.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify field measurements and circuiting arrangements are as indicated.

B. Verify that abandoned wiring and equipment serve only abandoned facilities.

C. Demolition drawings are based on casual field observation and existing record documents.

D. Report discrepancies to Architect before disturbing existing installation.

E. Beginning of demolition means installer accepts existing conditions.

3.02 PREPARATION

A. Disconnect electrical systems in walls, floors, and ceilings to be removed.

B. Coordinate utility service outages with utility company.

C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

D. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.
   1. Obtain permission from Owner at least 24 hours before partially or completely disabling system.
   2. Make temporary connections to maintain service in areas adjacent to work area.

E. Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Minimize outage duration.
   1. Notify Owner before partially or completely disabling system.
   2. Notify local fire service.
   3. Make notifications at least 24 hours in advance.
   4. Make temporary connections to maintain service in areas adjacent to work area.

F. Existing Telephone System: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.
   1. Notify Owner at least 24 hours before partially or completely disabling system.
   2. Notify telephone utility company at least 24 hours before partially or completely disabling system.
   3. Make temporary connections to maintain service in areas adjacent to work area.

3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Remove, relocate, and extend existing installations to accommodate new construction.

B. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.

C. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.

D. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

E. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.

F. Repair adjacent construction and finishes damaged during demolition and extension work.

G. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.

3.04 CLEANING AND REPAIR

A. See Section 01 7419 - Construction Waste Management and Disposal for additional requirements.

B. Clean and repair existing materials and equipment that remain or that are to be reused.

C. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

END OF SECTION

SECTION 26 0519

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 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. SUMMARY

B. This Section includes the following:
   1. Building wires and cables rated 600 V and less.
   2. Connectors, splices, and terminations rated 600 V and less.

1.02 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. High Voltage (Power): 35,001 volts and above

C. Low Voltage (Power): 90 to 2000 volts

D. Medium Voltage (Power): 2001 to 35,000 volts

E. NBR: Acrylonitrile-butadiene rubber.

1.03 SUBMITTALS

A. Product Data:
   1. Only for products specifically noted in this specification and/or on the plan drawings.

1.04 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Conductors and Cables
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. American Insulated Wire Corp.; a Leviton Company.
      b. General Cable Corporation.
      c. Southwire Company.

B. Connectors and Splices
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. AFC Cable Systems, Inc.
      b. Hubbell Power Systems, Inc.
      c. O-Z/Gedney; EGS Electrical Group LLC.
      d. 3M; Electrical Products Division.
      e. Tyco Electronics Corp.

2.02 CONDUCTORS AND CABLES

A. Copper Conductors: Comply with NEMA WC 70.

B. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN, XHHW(-2).

C. ***Multiconductor Cable: Comply with NEMA WC 70 for metal-clad cable, Type MC metal-clad cable and Type MC with ground wire.***

2.03 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 EXECUTION

3.01 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.02 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. General: Cables shall be plenum rated if installed in air handling plenum spaces.

B. Exposed Branch Circuits, Including in Crawlspaces: Type THHN/THWN, THHN/THWN-2, XHHW, or type XHHW-2 single conductors in raceway.

C. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN, THHN/THWN-2, XHHW, ~~or type~~ XHHW-2 single conductors in raceway***, or Type MC Cable***.

D. Class 1 Control Circuits: Type THHN-THWN, in raceway.

E. Class 2 Control Circuits: Type THHN-THWN, in raceway Power-limited cable, in raceway where concealed in building finishes, or Power-limited tray cable, in cable tray.

3.03 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

E. Support cables according to Division 26 Section "Hangers and Supports for Electrical Systems."

F. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."

G. Three-phase wiring: A maximum of three phase conductors, each of a different phase, neutral(s), and a grounding conductor shall be installed per conduit home run.

H. Division 26 Contractor shall compensate for voltage drop and derating of cables per the NEC based on actual installed conditions. If a conductor size is indicated to be larger than the minimum #12, on the plan drawings, provide that size conductor or larger.

I. Use 12 AWG minimum conductor size for general convenience receptacles in lieu of #12 AWG minimum for 20 ampere, 120 volt branch circuits where home runs are longer than 75 feet. Increase in size as required for a maximum of 3 percent voltage drop from panel to load. For other than general convenience receptacles, size conductor per load and conductor length for a maximum of 3 percent voltage drop.

J. All multi-wire branch circuits shall use dedicated neutrals for each phase circuit. Do not use combined neutral conductors.

K. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.

L. Derate conductors where conduits are exposed to sunlight on rooftops per NEC .

M. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

3.04 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 12 inches of slack from face of box.

D. All connections shall guarantee a good electrical and mechanical connection with conductor to conductor contact. No intermediary current path (material between conductors) is allowed.

3.05 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:
   1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
   2. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in cables and conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner.
      a. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.
      b. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
      c. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

C. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION

SECTION 26 0520

PATHWAYS FOR COMMUNICATIONS AND ELECTRONIC SAFETY AND SECURITY

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including but not limited to, General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Section 26 05 00 “Common Work Results for Electrical.”

1.02 SUMMARY

A. The intent of this Section is to outline the responsibility of the Division 26, 27, 28 Contractors and Owner for the installation of a complete empty conduit / rough-in system and support requirements for the communication and safety and security systems of the facility. The following systems are included as a part of this project:
   1. Pathways:
      a. Grounding and Bonding for Communication Systems - Division 26.
      b. Pathways for Communication Systems - Division 26.
      c. Sleeve and Sleeve Seals for Communications Pathways and Cabling - Division 26.
   2. Communication Systems:
      a. Communication Network Equipment Systems – Owner.
      b. Communication Voice System – Owner.
      c. Communication Horizontal Cabling - Division 27.
   3. Electronic Life Safety and Security:
      a. Conductors and Cables for Electronic Safety and Security - Division 28.
      b. Digital, Addressable Fire Alarm System - Division 28.

B. Section Includes
   1. Communication Fire Rated Pathways
   2. Raceway Innerduct
   3. Standard Backbox Support
   4. Communication Cable J-Hooks
   5. Communication Cable Vertical Cable Support
   6. Adjustable Cable Support

C. The complete cabling and equipment installation shall be provided by the Division(s) and Owner as defined above.

D. It shall be incumbent upon the Contractor to review and understand the installation requirements for the above listed systems.

E. Where conduit and backbox requirements are indicated on drawings, those requirements shall supersede the minimum requirements given in this section. Where no conduit or backbox requirements are indicated on drawings, the requirements of this section shall be used.

1.03 SEQUENCING AND SCHEDULING

A. Prior to the start of construction and throughout the entire construction period, the Contractor shall be responsible to coordinate with the Division 27 and Division 28 Contractor(s), and Owner as necessary for questionable items of size or to locate installation of all system components required on this project.

B. The Division 27 and Division 28 Contractor(s), and Owner shall furnish all required special and non-standard backboxes to the Division 26 Contractor at the start of construction. The Division 26 Contractor shall coordinate this requirement so that all the special and non-standard backboxes are delivered to the job site in a timely manner by the Division 27 and Division 28 Contractor(s) and Owner.

C. Upon completion of the raceway and conduit system and during construction of this project, the Division 27 and Division 28 Contractor(s), and Owner will provide all equipment, devices/wallplates, wire/cabling and all final terminations as delineated on in the documents.

1.04 DEFINITIONS

A. ARC: Aluminum rigid conduit.

B. Communication Pathway – Pathway consisting of products specifically designed for low voltage cabling support in accessible ceiling space. Communication Pathways shall include Cabletray, J-hooks, D-rings, Stirrup style straps, and Raceway.

C. EMT: Electrical metallic tubing.

D. ENT: Electrical nonmetallic tubing.

E. FMC: Flexible metallic conduit.

F. GRC: Galvanized rigid steel conduit.

G. HDPE: High density polyethylene conduit.

H. LFNC: Liquid tight flexible metallic tubing.

I. PVC: Polyvinyl chloride conduit.

J. Raceways: An enclosed channel of metal or nonmetallic materials designed expressly for holding wires, cables, or busbars.

K. RMC: Rigid metallic conduit.

L. RNC: Rigid nonmetallic conduit.

M. RTRC: Reinforced thermosetting resin conduit.

1.05 SUBMITTALS

A. Product Data:
   1. Communication Fire Rated Pathways
   2. Standard Backbox Support
   3. Communication Cable J-Hooks
   4. Communication Cable Vertical Cable Support
   5. Adjustable Cable Support

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
   1. Pathways.
      a. Show fabrication and installation details of pathways, including plans, elevations, and sections of components and attachments to other construction elements. Designate components and accessories, including clamps, brackets, hanger rods, splice-plate connectors, expansion-joint assemblies, straight lengths, and fittings.
      b. Provide weight calculations with cable data sheets for backup data to verify structural capacity.

C. Coordination Drawings: Floor plans and sections, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved.

D. Qualification Data: For professional engineer and testing agency.

E. Source quality-control test reports.

1.06 QUALITY ASSURANCE

A. Source Limitations: Obtain related components through one source from a single manufacturer if possible.

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.

C. Comply with NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store indoors to prevent water or other foreign materials from staining or adhering to components. Unpack and dry wet materials before storage.

PART 2 PRODUCTS

2.01 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:
   1. Cabletrays
      a. Cooper B-Line, Inc.
      b. Cope
      c. MONO-SYSTEMS, Inc.
   2. Fire, Smoke, and Acoustic Rated Pathways:
      a. Specified Technologies Incorporated (EZ Path Series of Pathways)
   3. Standard Backbox Support
      a. Erico CADDY (TSRBS1625 Telescoping Box Support)
   4. Communication Cable J-Hooks
      a. Erico CADDY (CAT Links)
   5. Communication Vertical Cable Supports
      a. Erico CADDY (CABLECAT)
   6. Adjustable Cable Support:
      a. Arlington (The LOOP)
      b. Erico CADDY (Adjustable Cable Support)

2.02 COMMON ELECTRICAL COMPONENTS

A. General Requirements: Comply with TIA/EIA-569-A.

B. Cable Support: NRTL labeled. Cable support brackets shall be designed to prevent degradation of cable performance and pinch points that could damage cable. Cable tie slots fasten cable ties to brackets.
   1. Comply with NFPA 70 and UL 2043 for fire-resistant and low-smoke-producing characteristics.
   2. Support brackets with cable tie slots for fastening cable ties to brackets.
   3. Lacing bars, spools, J-hooks, and Arlington Loops.
   4. Straps and other devices.
   5. Cables shall be supported by conduit, cable tray (ladder racks), approved cable hooks, and Arlington loops.
   6. Cable hooks shall be installed no farther than 5’-0” center to center mounting space.
   7. J-hooks: Steel, UL listed, ultimate static load limit 50 lbs. minimum. Wide base, beveled edges. Provide corners, drop-outs, and direction changes with coating (Xylan) for smooth, frictionless surface. Rated to support Category 6 and higher cables, and optical fiber cables. Size and quantity shall be as required.
   8. If required, assemble to manufacturer recommended specialty fasteners including beam clips, flange clips, drop wire/rod, C and Z purlin clips.
   9. Supply velcro straps, length and strength as required to properly organize and bundle cables.

C. Fire-Rated Pathways: UL Listed Fire-rated Pathway: Provide fire rated riser and horizontal pathways in configurations and locations as shown on the drawings or where required to pass cabling through fire rated floors or walls. See Architectural code plan for locations of fire rated partitions. Follow all manufacturers’ recommendations to provide a UL listed installation with an

"F'' rating that matches that of the partition. Provide ganged wall plates and riser plates for multiple pathway installations and label with manufacturer provided labels.

D. Provide cable tray as indicated on plan drawings.

E. Conduit and Boxes: Provided by Division 26 Contractor.

2.03 FIRE AND SMOKE RATED PATHWAYS

A. Materials:
   1. General: Use only products that have been tested for specific fire resistance rated construction conditions or acoustical and smoke related requirements conforming to construction assembly type, penetrating item type, annular space requirements, and rating involved for each separate instance.
   2. Fire-Rated Cable Grommet: STI EZ-Firestop Grommet is a molded, two-piece grommet with an integral fire and smoke sealing foam membrane for sealing individual cable penetrations through framed wall assemblies. Grommet snaps together around cable and locks tightly into the wall.
   3. Fire-Rated Cable Pathways: STI EZ-PATH® Fire-Rated Pathway device modules comprised of steel pathway with self-adjusting intumescent foam pads allowing 0 to 100 percent cable fill, the following products are acceptable:
   4. Smoke and Acoustical Pathways: STI EZ-PATH® Smoke & Acoustical Pathway device module comprised of a nonmetallic pathway with integral self-adjusting smoke and sound sealing system for cable penetrations through non-fire-resistance rated wall or floor assemblies, the following products are acceptable:

2.04 STANDARD BACKBOX SUPPORT

A. Adjustable from 12" to 25"

B. Accommodates up to 6-gang box in 16" stud spacing or up to 10-gang in 24" stud spacing

C. Will support four electrical boxes in 24" stud spacing

D. Adjustable after the electrical box is installed

E. For use with 4" square and 4-11/16" boxes and mud rings

2.05 COMMUNICATION CABLE J-HOOKS

A. UL listed and complies with NEC and TIA requirements for structured cabling systems

B. Suitable for air handling spaces (plenum)

C. Mulitple sizes/widths for varying communication cable bundle diameters.

D. Utilize clips or rods for structural support.

E. Provisions for cable securing component (Velcro strap) via pre-formed slot.

2.06 COMMUNICATION CABLE VERTICAL SUPPORT

A. Galvenized steel construction, with locking mechanism for cable capture.

B. Rounded edges for reduced cable jacket friction during pulling/installation.

C. Provisions for wall or strut mounting.

2.07 ADJUSTABLE CABLE SUPPORT

A. UL listed and complies with NEC and TIA requirements for structured cabling systems

B. Suitable for air handling spaces (plenum)

C. Adjustable for varying communication cable bundle diameters.

D. Utilize clips or rods for structural

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. Cable Trays: Comply with NEMA VE 2 and TIA/EIA-569-A.

B. Comply with requirements for demarcation point, pathways, cabinets, and racks specified in Section 27 11 00 "Communications Equipment Room Fittings." Drawings indicate general arrangement of pathways and fittings.

C. Comply with TIA/EIA-569-A for pull-box sizing and length of conduit and number of bends between pull points.

D. Comply with requirements in Section 26 05 33 "Raceway and Boxes for Electrical Systems" for installation of conduits and wireways

E. Install manufactured conduit sweeps and long-radius elbows whenever possible.

F. Pathway Installation in Communications Equipment Rooms:
   1. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed, or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
   2. Secure conduits to backboard when entering room from overhead.
   3. Extend conduits 4 inches above finished floor.
   4. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

G. Separation from EMI Sources:
   1. Comply with BICSI TDMM and TIA/EIA-569-A recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
   2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
      a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
      b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
      c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.
   3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
      a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
      b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
      c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.
   4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
      a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
      b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
      c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.
   5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
   6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

H. Conduit Color Requirements:
   1. All conduits for Communication and Electronic Safety and Security Systems shall have a factory applied coloring (field painting will be rejected) as follows:
      a. Communication Cabling: Blue
      b. Audio Visual: Yellow
      c. Security System: Green

d. Building Automation System: Purple
e. Fire Alarm: Red

3.02 INSTALLATION

A. Comply with BICSI TDMM for layout and installation of communications equipment rooms.

B. Bundle, lace, and train conductors and cables to terminal points without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

3.03 PATHWAY SIZING

A. Utilize the following table for pathway sizing/quantities. Contractor shall coordinate with specific cabling being provided, showing calculated quantities in shop drawing submittals.

B. EIA/TIA Pathway Sizing:

EIA/TIA PATHWAY SIZING										
		Maximum # of Cables - Cable Outside Diameter mm (inches)								
Trade Sizes		3.3 (.13)	4.6 (1.8)	5.6 (.22)	6.1 (.24)	7.4 (.29)	7.9 (.31)	9.4 (.37)	13.5 (.53)	15.8 (.62)
16.0	1/2"	1	1	0	0	0	0	0	0	0
21.0	3/4"	6	5	4	3	2	2	1	0	0
27.0	1"	8	8	7	6	3	3	2	1	0
41.0	1.25"	20	18	16	15	7	6	4	2	1
53.0	2"	30	26	22	20	14	12	7	4	3
78.0	3"	70	60	50	40	20	20	17	7	6
103.0	4"	0	0	0	0	0	0	30	14	12

3.04 FIRE RATED PATHWAYS

A. Division 26 Contractor shall verify final cable quantity/size with Division 27 contractor prior to ordering of fire rated pathways. Contractor shall include actual calculations with shop drawings prior to acceptance.

B. Comply with requirements in Section 07 84 13 - Penetration Firestopping.

C. Comply with TIA-569-B, Annex A, "Firestopping."

D. Comply with BICSI TDMM, "Firestopping Systems" Article.

E. EZ Path Basis of Design Pathway Sizing:

Cable Diameter		Pathway Cable Capacity			40% Fill Factor		
mm	inches	EZD22 Series	EZD33 Series	EZD44 Series	EZD22 Series	EZD33 Series	EZD44 Series
3.0	0.118	70	356	868	28	142	347
3.5	0.138	54	266	648	22	106	259
4.0	0.157	35	204	483	14	82	193
4.5	0.177	28	165	399	11	66	160
5.0	0.197	24	130	323	10	52	129
5.5	0.216	20	108	255	8	43	12
6.0	0.236	15	88	210	6	35	84

6.5	0.256	12	70	182	5	28	73
7.0	0.275	12	63	156	5	25	62
8.0	0.314	6	48	110	2	19	44
9.0	0.354	6	35	90	2	14	36
12.5	0.491	2	20	42	1	8	17
15.0	0.590	2	12	30	1	5	12
18.0	0.708	1	6	20	0	2	8
20.0	0.786	1	6	16	0	2	6
25.0	0.983	0	4	9	0	2	4
30.0	1.179	0	2	6	0	1	2
35.0	1.376	0	2	4	0	1	2

3.05 SLEEVE AND SLEEVE SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Common Work Results for Electrical.

3.06 COMMUNICATION BACKBONE, COMMUNICATION HORIZONTAL, VIDEO DISTRIBUTION, AND PUBLIC ADDRESS-INTERCOMMUNICATIONS AND MASS NOTIFICATION CABLING ROUGH-IN INSTALLATION

A. The Contractor shall comply with the following:
   1. Provide all required device back-boxes and junction boxes, locations as shown on plan drawings and coordinated with the Divisions 27 and 28 Contractors. Install blank coverplates for all boxes that do not receive a device.
   2. Coordinate all required device back boxes with their associated power receptacles such that they are mounted adjacent to each other (maximum 12” apart).
   3. Provide all raceways, conduits (minimum 1" unless otherwise indicated) and cabletray connections for installation of cabling systems by others. Install a pull-string in all raceways and conduits, 1-1/2" or less. For conduits larger than 1-1/2", use #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 string or pull wire inside boxes.
   4. Provide 1" minimum conduit from each communication and combination communication/AV outlet routed to nearest corridor cabletray (or designated communication pathway). Install non-metallic threadless insulating bushings on end of all conduits. For rooms with exposed structure ceilings stub conduit from back-box up to roof decking and bend conduit into room and extend 6" out from wall conduit to nearest corridor cabletray (or designated communication pathway).
   5. Communication outlets with adjacent 120V receptacle locations shall be installed adjacent to and at the same height as the 120V outlet.
   6. Conduit Stub-ups from Floor: All locations other than in a wall, provide IMC conduits with threaded steel couplings set flush with finish floor. Extend 6" above finish floor with IMC before any conversion. If conduit(s) do not extend up into equipment enclosures, etc. the IMC conduit(s) shall extend a minimum 6" above finished floor and be provided with non-metallic insulating bushings.
   7. Except in concrete or masonry walls, use of PVC conduits through floor slabs and above floor level will be unacceptable and will require the contractor to demolish and replace conduits through slab.
   8. Raceways 2-inch and smaller installed in interior spaces shall not exceed 150 feet in length. All raceways installed shall not contain more than two 90-degree bends or the equivalent. Provide pull-boxes or junction boxes as necessary to comply with these requirements, whether or not indicated on the drawings.

9. Bends in conduits shall be long sweep radius bends and in no instance shall the inside radius of bends be less than ten times the internal diameter for all conduit sizes.
10. Provide and size all mounting boards as indicated on plan drawings, minimum 3/4" thick AC plywood.
11. Provide for equipment grounding connections and grounding requirements at all equipment terminal systems and mounting boards.
12. Typical communication outlet conduit requirements: Provide 1" conduit minimum per outlet. Increase conduit size by 1/4" trade size for each additional two cables above four (or as required by box fill calculations). Conduit serving outlets in floor boxes or furniture shall include (2) 1 1/4" conduits minimum.
13. All device outlet boxes shall be minimum 4-11/16" square x 2-1/2" deep, with single-gang plaster ring. Provide two-gang plaster ring for outlets with over six cables indicated.
14. Video outlets: Provide and install 1" conduit to dedicated video locations routed to to nearest corridor cabletray (or designated communication pathway). Provide 4-11/16" square x 2-1/2" deep outlet box with single-gang plaster ring.

3.07 FIRE ALARM ROUGH-IN INSTALLATION

A. The Electrical Contractor shall comply with the following:
   1. Provide a complete raceway system (minimum ¾"), outlet boxes, junction boxes, fittings and supports. All fire alarm cabling shall be in conduit. All fire alarm conduits shall have manufactured applied red integral color. Conduit field painted will be rejected and replaced at the Contractor's expense. Final device location and quantities shall be per approved fire alarm shop drawings signed by the Authority Having Jurisdiction.
   2. All fire alarm junction box covers shall be labeled and completely painted with red paint.
   3. Mounting Heights:
      a. Install boxes for manual stations 48 inches (max.) above finished floor.
      b. Install boxes for wall mounted audible and visible signal devices 80 inches (max.) above finished floor or 6 inches below the ceiling, whichever is lowest.
      c. Install boxes for outdoor audible alarm devices at 10'-0" above finished floor, or as noted on drawings. Exact locations and mounting heights may vary in field. Contact Architect/Engineer for any conflicts prior to roughing-in.
   4. Detectors are shown on the drawings to indicate general coverage only and may not accurately show the required spacing. Locate boxes for the smoke detectors 15 feet (max.) from walls and 30 feet (max.) between detectors.
   5. Install pull wires in all empty conduits and raceways.
   6. Fire alarm conduits inside a building shall have a 6 ft. minimum separation between loops or be separated by a fire wall.
   7. Install all special and non-standard backboxes furnished by the Fire Alarm Systems Contractor.
   8. All audio/speaker boxes shall be minimum 4" square x 3" deep, with single or two gang plaster ring. Verify plaster ring with device being provided by the Fire Alarm Contractor.
   9. All other outlet boxes shall be minimum 4" square x 2½" deep, with single or two gang plaster ring. Verify plaster ring with device being provided by the Fire Alarm Contractor.
   10. Where devices are to be surface mounted DO NOT use boxes with multiple knockouts.
   11. Provide 120V-AC power to the fire alarm control panel and to all other fire alarm equipment requiring 120V power.

END OF SECTION

SECTION 26 0526

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes methods and materials for grounding systems and equipment.

1.03 SUBMITTALS

A. Product Data:
   1. Where called for specifically in this document or on plan drawings.

B. Field quality-control test reports.

C. Operation and Maintenance Data: For grounding to include the following in emergency, operation, and maintenance manuals:
   1. Instructions for periodic testing and inspection of grounding features at grounding connections for separately derived systems based on NETA MTS.
      a. Tests shall be to determine if ground resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if they do not.
      b. Include recommended testing intervals.

1.04 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with UL 467 for grounding and bonding materials and equipment.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. As specified in section 26 0519 “Low Voltage Electrical Power Conductors and Cables.

2.02 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:
   1. Solid Conductors: ASTM B 3.
   2. Stranded Conductors: ASTM B 8.
   3. Tinned Conductors: ASTM B 33.
   4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm)
   5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
   6. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
   7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

2.03 CONNECTORS

A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.
   1. Pipe Connectors: Clamp type, sized for pipe.

PART 3 EXECUTION

3.01 APPLICATIONS

A. Conductors: Install solid conductor for No. 10 AWG and smaller, and stranded conductors for No. 8 AWG and larger, unless otherwise indicated.

B. Conductor Terminations and Connections:
   1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
   2. Connections to Structural Steel: Welded connectors.

3.02 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
   1. Feeders and branch circuits.
   2. Lighting circuits.
   3. Receptacle circuits.
   4. Single-phase motor and appliance branch circuits.
   5. Three-phase motor and appliance branch circuits.
   6. Flexible raceway runs.
   7. Metal-clad cable runs.

C. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

D. Communication and Electronic Safety and Security Equipment: For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway to a telecommunications grounding busbar in each Telecommunications Room grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location. Grounding all equipment per manufacturer's recommendations. Ground each telecommunications grounding busbar to building steel, with conductor size as determined by conductor lengths listed below. If building steel is not available, connect the telecommunications grounding busbar to the service panel ground bar. Size the conductor at 2 kcmil per linear foot of conductor length up to a maximum size of 3/0 AWG copper, minimum of #4 copper.
   1. Ground conductor size from busbar to building steel or grounding electrode:
      a. #4 AWG copper for conductor length less than or equal to 20'-0".
      b. #2 AWG copper for conductor length greater than 20'-0" but less than or equal to 30'-0".
      c. #1/0 AWG copper for conductor length greater than 30'-0" but less than or equal to 50'-0".
      d. #2/0 AWG copper for conductor length greater than 50'-0" but less than or equal to 65'-0".
      e. #3/0 AWG copper for conductor length greater than 65'-0".
   2. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-2-by-12-inch (6-by-50-by-300-mm) grounding bus.
   3. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

E. Signal and Communication Equipment: In addition to grounding and bonding required by Article 800, provide a separate grounding system complying with requirements in TIA/ATIS J-STD-607-A.

1. For telephone, alarm, voice and data, 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
2. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a ¼-by-4-by-12-inch (6.3-by-100-by-300-mm) grounding bus.
3. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

F. Communication Circuits Operating at Less than 50 Volts: Circuits operating at less than 50 volts shall be grounded in accordance with NEC articles 720 and 725.

G. Fire Protective Signaling System: Fire protective signaling systems shall be grounding in accordance with NEC article 760.

3.03 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance, except where routed through short lengths of conduit.
1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install so vibration is not transmitted to rigidly mounted equipment.
3. Use exothermic-welded connectors for outdoor locations, but if a disconnect-type connection is required, use a bolted clamp.

C. Grounding and Bonding for Piping:
1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes, using a bolted clamp connector or by bolting a lug-type connector to a pipe flange, using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

D. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.

E. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet (18 m) apart.

F. Bond across water heater piping and water softener piping.

G. Bond together each metallic raceway (2” and larger), pipe, duct, and other metal object at non-contact entry into equipment enclosures. Use #2 AWG bare copper conductor.

H. Bond bushings where reducing washers or concentric knockouts are used.

END OF SECTION

SECTION 26 0529

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Hangers and supports for electrical equipment and systems.

1.03 DEFINITIONS

A. EMT: Electrical metallic tubing.

B. IMC: Intermediate metal conduit.

C. RMC: Rigid metal conduit.

1.04 PERFORMANCE REQUIREMENTS

A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

C. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

1.05 SUBMITTALS

A. Product Data: For the following:
   1. Steel slotted support systems.
   2. Nonmetallic slotted support systems.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following:
   1. Trapeze hangers. Include Product Data for components.
   2. Steel slotted channel systems. Include Product Data for components.
   3. Nonmetallic slotted channel systems. Include Product Data for components.
   4. Equipment supports.

C. Welding certificates.

1.06 QUALITY ASSURANCE

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

B. Comply with NFPA 70.

1.07 COORDINATION

A. Coordinate installation of roof curbs, equipment supports, and roof penetrations.

PART 2 PRODUCTS

2.01 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Allied Tube & Conduit.
b. Cooper B-Line, Inc.; a division of Cooper Industries.
c. ERICO International Corporation.
d. GS Metals Corp.
e. Thomas & Betts Corporation.
f. Unistrut; Tyco International, Ltd.
g. Wesanco, Inc.

2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
5. Channel Dimensions: Selected for applicable load criteria.

B. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported. Supports shall be Listed for the installation.

C. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

D. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

E. Non-metallic conduit supports shall be fabricated of Nylon 12. Corrosion resistant, non-metallic supports.

F. Conduit and Cabling: All conduit and cabling shall be supported with UL Listed and Approved supports.

G. Wire ties are not an acceptable form of raceway supports.

H. Metal decking shall not be used to support electrical devices, light fixtures, boxes or raceway.

I. Raceways must be a minimum of 1 1/2" from nearest surface of roof decking per NEC 300.4(E).

J. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) Hilti Inc.
      2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
      3) MKT Fastening, LLC.
      4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.
2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) Cooper B-Line, Inc.; a division of Cooper Industries.
      2) Empire Tool and Manufacturing Co., Inc.
      3) Hilti Inc.
      4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
      5) MKT Fastening, LLC.

3. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
5. Toggle Bolts: All-steel springhead type.
6. Hanger Rods: Threaded steel.

2.02 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Division 05 Section "Metal Fabrications" for steel shapes and plates.

PART 3 EXECUTION

3.01 APPLICATION

A. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.

B. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
   1. Secure raceways and cables to these supports with two-bolt conduit clamps, single-bolt conduit clamps, or single-bolt conduit clamps using spring friction action for retention in support channel.

3.02 SUPPORT INSTALLATION

A. Raceway Support Methods: EMT, IMC, and RMC may be supported by openings through structure members, as permitted in NFPA 70.

B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).

C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated:
   1. Backboards: Mount cabinets, lighting and appliance branch-circuit panelboards, disconnect switches, and control enclosures on plywood, fire-retardant treated, painted (gray), 3/4 inch. Comply with requirements for plywood backing panels specified in Division 6 Section "Rough Carpentry."

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
   1. To Wood: Fasten with lag screws or through bolts.
   2. To New Concrete: Bolt to concrete inserts.
   3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
   4. To Existing Concrete: Expansion anchor fasteners.
   5. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69 or Spring-tension clamps.
   6. To Light Steel: Sheet metal screws.
   7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, distribution panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.03 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

B. Field Welding: Comply with AWS D1.1/D1.1M.

3.04 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
   1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Touchup: Clean and touchup paint field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 26 0533

RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Sleeves for raceways and cables
   2. Sleeve seals
   3. Grout
   4. Metal conduits, tubing, and fittings.
   5. Nonmetal conduits, tubing, and fittings.
   6. Surface raceways.
   7. Boxes, enclosures, and cabinets.
   8. Multioutlet Assemblies (including divided surface raceway)

1.03 DEFINITIONS

A. ARC: Aluminum rigid conduit.

B. EMT: Electrical metallic tubing.

C. ENT: Electrical nonmetallic tubing.

D. EPDM: Ethylene-propylene-diene terpolymer rubber.

E. FMC: Flexible metal conduit.

F. GRC: Galvanized rigid steel conduit.

G. IMC: Intermediate metal conduit.

H. LFMC: Liquidtight flexible metal conduit.

I. LFNC: Liquidtight flexible nonmetallic conduit.

J. NBR: Acrylonitrile-butadiene rubber.

K. PVC: Polyvinyl chloride conduit.

L. RMC: Rigid metal (steel) conduit.

M. RNC: Rigid nonmetallic conduit.

N. RTRC: Reinforced thermosetting resin conduit

1.04 SUBMITTALS

A. Product Data:
   1. Surface raceways, wireways and fittings
   2. Hinged-cover enclosures
   3. Cabinets.

B. Qualification Data: For professional engineer and testing agency.

C. Source quality-control test reports.

1.05 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Sleeve Seals
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Advance Products & Systems, Inc.
      b. Calpico, Inc.
      c. GPT (basis of design: LINK-SEAL)
      d. Metraflex Co.
      e. Pipeline Seal and Insulator, Inc.

B. Metal Conduit and Tubing
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. AFC Cable Systems, Inc.
      b. Allied Tube & Conduit; a Tyco International Ltd. Co.
      c. Anamet Electrical, Inc.
      d. Electri-Flex Company.
      e. O-Z/Gedney; a brand of EGS Electrical Group.
      f. Picoma Industries, a subsidiary of Mueller Water Products, Inc.
      g. Republic Conduit.
      h. Robroy Industries.
      i. Southwire Company.
      j. Thomas & Betts Corporation.
      k. Western Tube and Conduit Corporation.
      l. Wheatland Tube Company; a division of John Maneely Company.

C. Nonmetallic Conduit and Tubing
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. AFC Cable Systems, Inc.
      b. Anamet Electrical, Inc.
      c. Arnco Corporation.
      d. CANTEX Inc.
      e. CertainTeed Corp.
      f. Condux International, Inc.
      g. Electri-Flex Company.
      h. Kraloy.
      i. Lamson & Sessions; Carlon Electrical Products.
      j. Niedax-Kleinhuis USA, Inc.
      k. RACO; a Hubbell company.
      l. Thomas & Betts Corporation.

D. Metal Wireways
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Cooper B-Line, Inc.
      b. Hoffman.
      c. Square D; Schneider Electric.

E. Boxes, Enclosures, and Cabinets

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    a. Adalet.
    b. Cooper Technologies Company; Cooper Crouse-Hinds.
    c. EGS/Appleton Electric.
    d. Erickson Electrical Equipment Company.
    e. FSR Inc.
    f. Hoffman; a Pentair company.
    g. Hubbell Incorporated; Killark Division.
    h. Kraloy.
    i. Milbank Manufacturing Co.
    j. Mono-Systems, Inc.
    k. O-Z/Gedney; a brand of EGS Electrical Group.
    l. RACO; a Hubbell Company.
    m. Robroy Industries.
    n. Spring City Electrical Manufacturing Company.
    o. Stahlin Non-Metallic Enclosures; a division of Robroy Industries.
    p. Thomas & Betts Corporation.
    q. Wiremold / Legrand.

2.02 SLEEVES FOR RACEWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel.
    1. Minimum Metal Thickness:
        a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side more than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
        b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches (1270 mm) and 1 or more sides equal to, or more than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.03 SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
    1. Sealing Elements: EPDM NBR interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
    2. Pressure Plates: Plastic Carbon steel. Include two for each sealing element.
    3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.04 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.05 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 250 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.

2.06 METAL CONDUIT AND TUBING

A. RMC Rigid Steel Conduit: ANSI C80.1.

B. Aluminum Rigid Conduit: ANSI C80.5.

C. IMC: ANSI C80.6.

D. PVC-Coated Steel Conduit: PVC-coated RMC.
1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch (1 mm) , minimum.

E. EMT: ANSI C80.3.

F. FMC: Zinc-coated steel.

G. LFMC: Flexible steel conduit with PVC jacket.

H. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.
1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
2. Fittings for EMT: Zinc coated steel with set-screw or compression fittings with insulated throat type.
3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness, 0.040 inch (1 mm), with overlapping sleeves protecting threaded joints.

I. Joint Compound for Rigid Steel Conduit (RMC) or IMC: Listed for use in cable connector assemblies, and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

2.07 NONMETALLIC CONDUIT AND TUBING

A. ENT: NEMA TC 13.

B. RNC: NEMA TC 2, Type EPC-40-PVC, unless otherwise indicated.

C. LFNC: UL 1660.

D. Fittings for ENT and RNC: NEMA TC 3; match to conduit or tubing type and material.

E. Fittings for LFNC: UL 514B.

2.08 METAL WIREWAYS

A. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 1, unless otherwise 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 wireways as required for complete system.

C. Wireway Covers: Hinged type unless scheduled differently on plan drawings.

D. Finish: Manufacturer's standard enamel finish.

2.09 SURFACE RACEWAYS

A. Surface Metal Raceways: For exposed raceways for single use in unfinished areas where indicated or where required in existing areas where concealed conduit is not possible. Install a

separate, green, ground conductor in raceways from junction box supplying raceways to receptacle or fixture ground terminals. Galvanized steel with snap-on covers. Prime coating, ready for field painting.

2.10 BOXES AND ENCLOSURES AND CABINETS

A. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

B. Cast-Metal Outlet and Device Boxes: NEMA FB 1, aluminum, Type FD, with gasketed cover.

C. Nonmetallic Outlet and Device Boxes: NEMA OS 2.

D. Metal Floor Boxes: Sheet metal with anti corrosion coverig, fully adjustable, rectangular.

E. Nonmetallic Floor Boxes: Nonadjustable, round.

F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

G. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, galvanized, cast iron with gasketed cover.

H. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.
   1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
   2. Nonmetallic Enclosures: Plastic.

I. Cabinets:
   1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
   2. Hinged door in front cover with flush latch and concealed hinge.
   3. Key latch to match panelboards.
   4. Metal barriers to separate wiring of different systems and voltage.
   5. Accessory feet where required for freestanding equipment.

2.11 MULTIOUTLET ASSEMBLIES (SURFACE DIVIDED RACEWAYS)

A. Divided Raceways: U.L., two-piece design with divider integral with base and snap on covers. Corner and tee fittings shall have a 2-inch bend radius to support fiber cable.
   1. Basis of Design: Legrand 4000 Series

B. Types, sizes, lengths and channels as indicated and required for each application, with fittings that match and mate with raceways.

C. Components of Assemblies: Products from a single manufacturer designed for use as a complete, matching assembly of raceways and devices for communication wiring and duplex receptacles.

D. Accessories: Provide accessories devices for a complete system and as required for devices indicated on drawings. Provide device covers to match system.

E. Wire: No. 12 AWG. Provide equipment grounding conductor.

PART 3 EXECUTION

3.01 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls, before concrete is poured in place.

C. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

D. Cut sleeves to length for mounting flush with both surfaces of walls.

E. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.

F. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable, unless indicated otherwise.

G. Seal space outside of sleeves with grout for penetrations of concrete and masonry
   1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

H. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants.".

I. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Sections.

J. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

K. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

3.02 SLEEVE-SEAL INSTALLATION

A. Install to seal exterior wall penetrations.

B. Use 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.

3.03 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:
   1. Exposed Conduit: Rigid steel conduit (RMC)
   2. Concealed Conduit, Aboveground: IMC or EMT.
   3. Underground Conduit: RNC, Type EPC-40 -PVC, direct buried with PVC-coated RMC elbows.
   4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
   5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R or 4.
   6. Boxes: Cast aluminum. Malleable iron is prohibited.
   7. Application of Handholes and Boxes for Underground Wiring:
      a. Handholes and Pull Boxes in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Polymer concrete, SCTE 77, Tier 15 structural load rating.
      b. Handholes and Pull Boxes in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: Polymer-concrete units, SCTE 77, Tier 8 structural load rating.
      c. Handholes and Pull Boxes Subject to Light-Duty Pedestrian Traffic Only: Fiberglass-reinforced polyester resin, structurally tested according to SCTE 77 with 3000-lbf (13 345-N) vertical loading.

B. Comply with the following indoor applications, unless otherwise indicated:
   1. Exposed, Not Subject to Physical Damage: EMT. MC cable (maximum of 6') may be used for luminaire connection above acoustical ceilings.
   2. Exposed, Not Subject to Severe Physical Damage: EMT.
   3. Exposed and Subject to Severe Physical Damage: Rigid steel conduit (RMC). Includes raceways in the following locations but is not limited to:

a. Loading dock.
b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
c. Mechanical rooms.

4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Risers: All through floor conduit risers shall be RMC.
6. Embedded in or below slabs: RMC or RNC with PVC-coated RMC elbows. Change from RNC to RMC with PVC-coated RMC elbows before rising above the floor.
7. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations. Maximum of 6' in length unless otherwise approved.
8. Connections to undercabinet light fixtures: 3/8" MC cable.
9. Damp or Wet Locations: Rigid steel conduit (RMC).
10. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4X, stainless steel in damp or wet locations.
11. Hazardous Locations: Comply with the NEC.
12. Exposed, Not Subject to Severe Physical Damage In Pool Areas: Galvanized RMC with stainless steel boxes and enclosures. Threads shall be protected. Where conduit is painted, galvanized EMT with compression connectors and Bell boxes and enclosures with weatherproof, gasketed covers. Exposed conduit to pool chemical rooms shall use PVC conduit, non-metallic supports, and non-metallic gasketed boxes.

C. Minimum Raceway Size 3/4-inch (21-mm) trade size for branch circuit homeruns and all exterior work unless otherwise noted; 1/2-inch (16-mm) for other interior work unless otherwise noted.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with that material. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer.

E. Install nonferrous conduit or tubing for circuits operating above 60 Hz. Where aluminum raceways are installed for such circuits and pass through concrete, install in nonmetallic sleeve.

F. Do not install aluminum conduits in contact with concrete.

G. All conduits 2" and larger shall have grounding bushings on ends.

3.04 INSTALLATION

A. Keep raceways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

B. Complete raceway installation before starting conductor installation.

C. Support raceways as specified in Division 26 Section "Hangers and Supports for Electrical Systems."

D. Protect stub-ups from damage where conduits rise through floor slabs. Arrange stub-ups so curved portions of bends are not visible above the finished slab.

E. Stub-up Connections: Extend conduits through concrete floor for connection to freestanding equipment. Install with an adjustable top or coupling threaded inside for plugs set flush with finished floor. Extend conductors to equipment with rigid steel conduit; FMC may be used 6 inches (150 mm) above the floor. Install screwdriver-operated, threaded plugs flush with floor for future equipment connections.

F. Mounting Heights: Install equipment and devices at heights indicated on Electrical Symbols & Abbreviations sheet, unless noted otherwise.

G. Backboxes shall not be installed back-to-back. Provide 6-inch separation minimum unless otherwise noted.

H. Do not install backboxes in fully grouted cells of masonry walls.

I. Outlet boxes shall not be set back more than 1/4" from finished wall. Devices shall be rigidly supported to the box (not the wall) at the surface of the wall.

J. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

K. Conduit and Cabling: Install level, plumb, and parallel and perpendicular to other building systems and components, unless otherwise indicated.

L. Conduit shall be concealed in pre-cast panels. The electrical contractor is responsible for the installation, coordination, material, and labor of conduit, boxes, etc installed in pre-cast panels.

M. Install no more than the equivalent of four 90-degree bends in any conduit run for power cabling.

N. Install no more than the equivalent of two 90-degree bends in any conduit run for communication, life safety, and security cabling.

O. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.

P. Raceways Embedded in Slabs:
   1. Run conduit larger than 1-inch (27-mm) trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
   2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
   3. Change from ENT to RNC, Type EPC-40-PVC, to rigid steel conduit, or IMC before rising above the floor. Use RMC elbows.

Q. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

R. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

S. Terminations:
   1. Where raceways are terminated with locknuts and bushings, align raceways to enter squarely and install locknuts with dished part against box. Use two locknuts, one inside and one outside box.
   2. Where raceways are terminated with threaded hubs, screw raceways or fittings tightly into hub so end bears against wire protection shoulder. Where chase nipples are used, align raceways so coupling is square to box; tighten chase nipple so no threads are exposed.

T. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire.

U. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
   1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces (coolers and freezers).
   2. Where otherwise required by NFPA 70.

V. Expansion-Joint Fittings for RNC: Install in each run of aboveground conduit that is located where environmental temperature change may exceed 30 deg F (17 deg C), and that has straight-run length that exceeds 25 feet (7.6 m).
   1. Install expansion-joint fittings for each of the following locations, and provide type and quantity of fittings that accommodate temperature change listed for location:

a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C) temperature> temperature change.
b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C) temperature change.
c. Indoor Spaces: Connected with the Outdoors without Physical Separation: 125 deg F (70 deg C) temperature change.
d. Attics: 135 deg F (75 deg C) temperature change.

2. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F (0.06 mm per meter of length of straight run per deg C) of temperature change.
3. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at the time of installation.

W. Expansion Joints:
1. Conduits 3 inches and larger, rigidly secured to building construction on opposite sides of a building expansion joint, shall be provided with expansion and deflection couplings. The couplings shall be installed in accordance with the manufacturer's recommendations.
2. Conduits smaller than 3 inches shall be provided with junction boxes on both sides of the expansion joint, and connected by 15 inches of slack flexible conduit. Flexible conduit shall have a copper green ground bonding jumper installed. In lieu of this flexible conduit, expansion and def-lection couplings as specified above may be installed.
3. An expansion fitting is required to compensate for thermal expansion and contraction for RNC where the length of the raceway change is expected to be 1/4 in. or greater in a straight run between securely mounted items such as boxes, cabinets, elbows, or other conduit terminations per NEC 352.44.

X. Flexible Conduit Connections: Use maximum of 72 inches (1830 mm) of flexible conduit for recessed and semirecessed lighting fixtures equipment subject to vibration, noise transmission, or movement; and for transformers and motors. Flex shall be supported per NEC. Flex to light fixtures shall not rest on ceiling grid.
1. Use LFMC in damp or wet locations subject to severe physical damage.
2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.

Y. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry masonry block, and install box flush with surface of wall. Boxes shall rest on block not on mortar. Do not install boxes in corner of block.

3.05 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Sections.

3.06 PROTECTION

A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of 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 touchup coating recommended by manufacturer.

END OF SECTION

SECTION 26 0553

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Identification for raceway.
   2. Identification for conductors.
   3. Warning labels and signs.
   4. Instruction signs.
   5. Equipment identification labels.
   6. Miscellaneous identification products.

1.03 SUBMITTALS

A. Product Data: For each electrical identification product indicated.

B. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

1.04 QUALITY ASSURANCE

A. Comply with ANSI A13.1 and ANSI C2.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.145.

D. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.05 COORDINATION

A. Coordinate identification names, abbreviations, colors, and other features with requirements in the Contract Documents, Shop Drawings, Owner, Owner’s room numbers (not plan room numbers) manufacturer's wiring diagrams, and the Operation and Maintenance Manual, and with those required by codes, and standards. Use consistent designations throughout Project.

B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

C. Coordinate installation of identifying devices with location of access panels and doors.

D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 PRODUCTS

2.01 RACEWAY AND METAL-CLAD CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Color for Printed Legend:
   1. Power Circuits: Black letters on an orange field.
   2. Legend: Indicate system or service and voltage, if applicable.

C. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

D. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

E. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

F. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; 2 inches wide; compounded for outdoor use.

2.02 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

B. Permanent Black Marker: Provide neatly handwritten label on each junction box and on the inside of each device cover plate indicating associated panel and circuit number.

2.03 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Metal-Backed, Butyrate Warning Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for application. 1/4-inch grommets in corners for mounting. Nominal size, 10 by 14 inches.

C. Warning label and sign shall include, but are not limited to, the following legends:
   1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."

2.04 INSTRUCTION SIGNS

A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. in. and 1/8 inch thick for larger sizes.
   1. Engraved legend with black letters on white face.
   2. Punched or drilled for mechanical fasteners.
   3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.05 EQUIPMENT IDENTIFICATION LABELS

A. Self-Adhesive, Engraved, Laminated Acrylic or Melamine Label: Adhesive backed. Minimum letter height shall be 3/8 inch.

B. Label Color Coding as follows:
   1. Normal Power System:White letters on Dark Grey background
   2. Life Safety Power System: White letters on Red background
   3. Critical Power System: Black letters on Yellow background
   4. Emgergency Equipment Power System: White letters on Red background
   5. Communications System: White letters on Blue background

2.06 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Cable Ties: Fungus-inert, self-extinguishing, 1-piece, self-locking, Type 6/6 nylon cable ties.
   1. Minimum Width: 3/16 inch .
   2. Tensile Strength: 50 lb , minimum.
   3. Temperature Range: Minus 40 to plus 185 deg F.
   4. Color: Black, except where used for color-coding.

B. Paint: Paint materials and application requirements are specified in Division 09 painting Sections.

C. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 EXECUTION

3.01 APPLICATION

A. Accessible Raceways, 600 V or Less, for Service, Feeder, and Branch Circuits: Identify with orange self-adhesive vinyl tape applied in bands.

B. Power-Circuit Conductor Identification: For primary and secondary conductors No.4 AWG and larger in vaults, pull and junction boxes, manholes, and handholes use color-coding conductor tape. Identify source and circuit number of each set of conductors. For single conductor cables, identify phase in addition to the above.

C. Branch-Circuit Conductor Identification: Where there are conductors for more than three branch circuits Identify all conductors in same junction or pull box, use color-coding conductor tape. Identify each ungrounded conductor according to phase source and circuit number.

D. Paint fire alarm system junction boxes and covers red.

E. Permanent Black Marker: Provide neatly handwritten label on each junction box indicating associated panel and circuit number.

F. Emergency Receptacles: Identify panelboard and circuit number from which served. Engrave faceplate.

G. Where the premises wiring system has branch circuits supplied from more than one nominal voltage system, each ungrounded conductor of a branch circuit, where accessible, shall be identified by system per 2005 NEC 210.5(C). The means of identification shall be permanently posted on each branch-circuit distribution panelboard/equipment.

H. Conductors to Be Extended in the Future: Attach marker tape to conductors and list source and circuit number.

I. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, signal, sound, intercommunications, voice, and data connections.
   1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
   2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
   3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and Operation and Maintenance Manual.

J. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply self-adhesive warning. Identify system voltage with black letters on an orange background. Apply to exterior of door, cover, or other access.
   1. Equipment with Multiple Power or Control Sources: Apply to door or cover of equipment including, but not limited to, the following:
      a. Power transfer switches.
      b. Controls with external control power connections.
   2. Equipment Requiring Workspace Clearance According to NFPA 70: Unless otherwise indicated, apply to door or cover of equipment but not on flush panelboards and similar equipment in finished spaces.

K. Apply warning, caution, and instruction signs as follows:
   1. Warnings, Cautions, and Instructions: Install 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 are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.

a. Install a plaque on all disconnect switches controlling remote equipment that identifies its purpose per NEC.
b. Install a plaque at each main disconnect for services with multiple main disconnects per NEC.
c. Install a plaque on each piece of distribution equipment that incorporates series rated circuit breaker devices per NEC.

L. Each panelboard, new and existing, shall be provided with a neatly typed directory with plastic protector. The Division 26 Contractor is responsible for providing the room name and/or number per the Owner's designations. The Owner's designation may not be the same as the Drawings. Division 26 is responsible for coordinating with the Owner for the designations.

M. Instruction Signs:
1. Operating Instructions: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
2. Emergency Operating Instructions: Install instruction signs with white legend on a red background with minimum 3/8-inch- (10-mm-) high letters for emergency instructions at equipment used for fire alarm system.

N. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
1. Labeling Instructions:
a. Indoor Equipment: Self-adhesive, engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- high label; where 2 lines of text are required, use labels 2 inches high.
b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
2. Equipment to Be Labeled:
a. Panelboards, electrical cabinets, and enclosures.
b. Access doors and panels for concealed electrical items.
c. Emergency system boxes and enclosures.
d. Disconnect switches.
e. Enclosed circuit breakers.
f. Push-button stations.
g. Power transfer equipment.
h. Contactors.
i. Voice and data cable terminal equipment.
j. Fire-alarm control panel and annunciators.
k. Monitoring and control equipment.
l. Terminals, racks, and patch panels for voice and data communication and for signal and control functions.

3.02 INSTALLATION

A. Verify identity of each item before installing identification products.

B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

C. Apply identification devices to surfaces that require finish after completing finish work.

D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

E. Attach nonadhesive signs and plastic labels with screws and auxiliary hardware appropriate to the location and substrate.

F. System Identification Color Banding for Raceways and Cables: Each color band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

G. Color-Coding for Phase and Voltage Level Identification, 600 V and Less: Use the colors listed below for ungrounded service, feeder, and branch-circuit conductors.
   1. Colors for 208/120-V Circuits:
      a. Phase A: Black.
      b. Phase B: Red.
      c. Phase C: Blue.
      d. Neutral: White.
      e. Ground: Green.
   2. Colors for 480/277-V Circuits:
      a. Phase A: Brown.
      b. Phase B: Orange.
      c. Phase C: Yellow.
      d. Neutral: Gray; or White with colored stripe (other than green).
      e. Ground: Green.
   3. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

H. Painted Identification: Prepare surface and apply paint according to manufacturer recommendations.

END OF SECTION

SECTION 26 0943

NETWORK LIGHTING CONTROLS AND DEVICES

P1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Indoor occupancy sensors

1.03 DEFINITIONS

A. BACnet: A networking communication protocol that complies with ASHRAE 135.

B. BAS: Building automation system.

C. DALI: Digital addressable lighting interface.

D. LED: Light-emitting diode.

E. Lighting Control Protocol (LCP): This term shall be used to generically reference any individual manufacturers control protocol, and the contractor shall reference the manufacturer's documentation for specifics.

F. LonWorks: A control network technology platform for designing and implementing interoperable control devices and networks.

G. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling and power-limited circuits.

H. Monitoring: Acquisition, processing, communication, and display of equipment status data, metered electrical parameter values, power quality evaluation data, event and alarm signals, tabulated reports, and event logs.

I. PC: Personal computer; sometimes plural as "PCs."

J. PIR: Passive infrared.

K. Power Line Carrier: Use of radio-frequency energy to transmit information over transmission lines whose primary purpose is the transmission of power.

L. RS-485: A serial network protocol, similar to RS-232, complying with TIA/EIA-485-A.

1.04 SUBMITTALS

A. Shop Drawings: Detail assemblies of standard components, custom assembled for specific application on this Project.
   1. Outline Drawings: Indicate dimensions, weights, arrangement of components, and clearance and access requirements.
   2. 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.
   3. Wiring Diagrams: Power, signal, and control wiring. Coordinate nomenclature and presentation with a block diagram.

B. 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.

C. Software and Firmware Operational Documentation:
   1. Software operating and upgrade manuals.
   2. Program Software Backup: On a compact disc, complete with data files.
   3. Device address list.
   4. Printout of software application and graphic screens.

D. Field quality-control test reports.

E. Software licenses and upgrades required by and installed for operation and programming of digital and analog devices.

F. Operation and Maintenance Data: For lighting controls to include in emergency, operation, and maintenance manuals.

G. Warranty: Special warranty specified in this Section.

1.05 QUALITY ASSURANCE

A. Source Limitations: Obtain lighting control module and power distribution components through one source from a single manufacturer.

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.

C. Comply with 47 CFR, Subparts A and B, for Class A digital devices.

D. Comply with NFPA 70.

1.06 COORDINATION

A. Coordinate lighting control components to form an integrated interconnection of compatible components.
   1. Match components and interconnections for optimum performance of lighting control functions.

1.07 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of lighting controls that fail in materials or workmanship or from transient voltage surges within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.

1.08 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Manual Switches/Wall plates: Equal to 1 percent of amount installed, but no fewer than 2 switches/wall plates.
   2. Occupancy Sensors: Equal to 1 percent of amount installed, but no fewer than 2 sensors.

PART 2 PRODUCTS

2.01 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. Crestron
   2. Encelium
   3. Fifth Light
   4. Leviton
   5. Lutron

6. nLight

2.02 MANUAL SWITCHES/SYSTEM DIMMERS AND PLATES

A. Push-Button Switches: Modular, momentary-contact, low-voltage type.
   1. Match color specified in Division 26 Section "Wiring Devices."
   2. One, Four, or Eight button switches (as indicated on plan drawings) with Integral manual dimming for 10-100% dimming.
   3. Integral LED pilot light to indicate when circuit is on.
   4. Internal LED locator light to illuminate when circuit is off.

B. Manual, Maintained Contact, Full- or Low-Voltage Switch: Comply with Division 26 Section "Wiring Devices."

C. Wall Plates: Single and multigang plates as specified in Division 26 Section "Wiring Devices."

D. Legend: Engraved or permanently silk-screened on wall plate where indicated. Use designations indicated on Drawings.

2.03 INDOOR OCCUPANCY SENSORS

A. General Description: Wall- or ceiling-mounting, solid-state units with a separate relay unit.
   1. Operation: Unless otherwise indicated, turn lights on when covered area is occupied and off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 30 minutes.
   2. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.
   3. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
   4. Mounting:
      a. Sensor: Suitable for mounting in any position on a standard outlet box.
      b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
      c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
   5. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.
   6. Bypass Switch: Override the on function in case of sensor failure.

B. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; providing dimming level signal to designated fixtures. Coordinate with provided products.

C. Ultrasonic Type: Ceiling mounting; detect occupancy by sensing a change in pattern of reflected ultrasonic energy in area of coverage.
   1. Detector Sensitivity: Detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
   2. Detection Coverage (Small Room): Detect occupancy anywhere within a circular area of 600 sq. ft. when mounted on a 96-inch- high ceiling.
   3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.
   4. Detection Coverage (Large Room): Detect occupancy anywhere within a circular area of 2000 sq. ft. when mounted on a 96-inch- high ceiling.
   5. Detection Coverage (Corridor): Detect occupancy anywhere within 90 feet when mounted on a 10-foot- high ceiling in a corridor not wider than 14 feet.

D. Dual-Technology Type: Ceiling mounting; detect occupancy by using a combination of PIR and ultrasonic detection methods in area of coverage. Particular technology or combination of

technologies that controls on-off functions shall be selectable in the field by operating controls on unit.

1. Sensitivity Adjustment: Separate for each sensing technology.
2. Detector Sensitivity: Detect occurrences of 6-inch- minimum movement of any portion of a human body that presents a target of not less than 36 sq. in., and detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.

2.04 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Class 2 Power Source: Not smaller than No. 12 AWG, complying with Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

B. Classes 2 and 3 Control Cables: Multiconductor cable with copper conductors not smaller than No. 22 AWG, complying with Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cables: Multiconductor cable with copper conductors not smaller than No. 16 AWG, complying with Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

D. Digital and Multiplexed Signal Cables: Unshielded, twisted-pair cable with copper conductors, complying with Division 27 Section "Communications Horizontal Cabling." Requirements for data cabling.

PART 3 EXECUTION

3.01 WIRING INSTALLATION

A. Wiring Method: Install wiring in raceways. Comply with Division 26 Section "Low-Voltage Electrical Power Conductors and Cables" Minimum conduit size shall be 3/4”.

1. Unshielded twisted-pair cables: Install using cable J-hooks and cable ties for plenum rated cables installed in free air above accessible ceilings, with maximum spacing for support. Support from ceiling grid, ceiling support cables, or other systems piping and conduit is not permitted. See Section 26 05 20 – Pathways for Communications and Electronic Safety and Security.

B. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Separate power-limited and non-power-limited conductors according to conductor manufacturer's written instructions.

C. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.

D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in terminal cabinets, equipment enclosures, and in junction, pull, and outlet boxes.

E. Identify components and power and control wiring according to Division 26 Section "Identification for Electrical Systems."

3.02 APPLICATION

A. Utilize Ultrasonic style occupancy sensors in restrooms, dual technology in all other locations (unless noted specifically on plan drawings otherwise).

3.03 SENSOR INSTALLATION

A. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

B. Contractor shall turn off the self-learning feature of the occupancy sensors.

3.04 IDENTIFICATION

A. Identify components and power and control wiring according to Division 26 Section "Identification for Electrical Systems."
   1. Identify controlled circuits in lighting contactors.
   2. Identify circuits or luminaries controlled by photoelectric and occupancy sensors at each sensor.

B. Label time switches and relays with a unique designation.

3.05 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:
   1. After installing time switches and sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.
   2. Operational Test: Verify operation of each lighting control device, and adjust time delays.

C. Lighting control devices that fail tests and inspections are defective work.

3.06 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting sensors and to assist Owner's personnel in making program changes to suit actual occupied conditions. Provide up to two visits to Project during other than normal occupancy hours for this purpose.

3.07 DEMONSTRATION

A. Provide the Owner and their representative’s hands-on instruction on the use and maintenance of the systems in (2) 2 hour sessions. The Integrator shall videotape all of the training sessions:

B. Training of the Owner’s operation and maintenance personnel is required in cooperation with the Owner and the Commissioning Professional. Provide competent, factory-authorized personnel to provide instruction to operation and maintenance personnel concerning the location, operation, and troubleshooting of the installed systems. The instruction shall be scheduled in coordination with the Owner and the Commissioning Professional after submission and approval of formal training agendas.

END OF SECTION

SECTION 26 2726
WIRING DEVICES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Receptacles, receptacles with integral GFCI, and associated device plates.

B. Related Sections include the following:
   1. Division 27 Section "Communications Horizontal Cabling" for workstation outlets.

1.03 DEFINITIONS

A. EMI: Electromagnetic interference.

B. GFCI: Ground-fault circuit interrupter.

C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

D. RFI: Radio-frequency interference.

E. SPD: Surge protective device.

F. UTP: Unshielded twisted pair.

1.04 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

1.05 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.

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.

C. Comply with NFPA 70.

1.06 COORDINATION

A. Receptacles for Owner-Furnished Equipment: Match plug configurations.
   1. Communication Rooms
   2. FFE Equipment
   3. Cord and Plug Sets: Match equipment requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. General Wiring Devices

B. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
   1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).
   2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
   3. Leviton Mfg. Company Inc. (Leviton).
   4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).

2.02 STRAIGHT BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Cooper; 5351 (single), CR5362 (duplex).
      b. Hubbell; HBL5351 (single), HBL5352 (duplex).
      c. Leviton; 5891 (single), 5352 (duplex).
      d. Pass & Seymour; 5361 (single), 5362 (duplex).

B. Tamper-Resistant Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Cooper; TR8300.
      b. Hubbell; HBL8300SGA.
      c. Leviton; 8300-SGG.
      d. Pass & Seymour; TR63H.
   2. Provide tamper-resistant receptacles in Pre-K, K and first grade classrooms. Refer to drawings.

2.03 GFCI RECEPTACLES

A. General Description:
   1. Straight blade, non-feed through type.
   2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
   3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:
   1. Products: Subject to compliance with requirements, provide products by one of the following:
      a. Cooper; VGF20.
      b. Hubbell; GFR5352L.
      c. Pass & Seymour; 2095.
      d. Leviton; 7590.

C. Tamper-Resistant GFCI Convenience Receptacles, 125 V, 20 A:
   1. Products: Subject to compliance with requirements, provide products by one of the following:
      a. Hubbell; GFTR20.
      b. Pass & Seymour; 2095TR.

D. Blank Face ("Faceless") GFCI Test Device
   1. Products: Subject to compliance with requirements, provide products by one of the following:
      a. Cooper
      b. Hubbell
      c. Leviton
      d. Pass & Seymour

2.04 DAMP AND WET LOCATION RECEPTACLES

A. 15 and 20 ampere, 125 and 250 volt, non locking receptacles shall be listed weather-resistant type. This requirement includes GFCI and TVSS type receptacles.

2.05 WALL PLATES

A. Single and combination types to match corresponding wiring devices.
   1. Plate-Securing Screws: Metal with head color to match plate finish.

2. Material for Finished Spaces: Smooth, high-impact thermoplastic.
3. Material for Unfinished Spaces: 0.035-inch- (1-mm-) thick, 302 satin-finished stainless steel.
4. Material for Damp Locations: 0.035-inch- (1-mm-) thick, 302 satin-finished stainless steel. with spring-loaded lift cover, and listed and labeled for use in "wet locations."

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant, die-cast aluminum with while-in-use, gasketed, lockable cover. Covers shall be Hubbell #WP26M series, or equivalent.

C. Lockable wall plates similar to Hubbell HBL96061/HBL96067.

2.06 FINISHES

A. Color: Wiring device catalog numbers in Section Text do not designate device color.
1. Wiring Devices Connected to Normal Power System in finished spaces: White, unless otherwise indicated or required by NFPA 70 or device listing.

B. Wall Plate Color: For plastic covers, match device color.

PART 3 EXECUTION

3.01 INSTALLATION

A. Coordination with Other Trades:
1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

B. Conductors:
1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Provide the grounded conductor at the switches controlling lighting loads.
5. Existing Conductors:
a. Cut back and pigtail, or replace all damaged conductors.
b. Straighten conductors that remain and remove corrosion and foreign matter.
c. Pigtailing existing conductors is permitted provided the outlet box is large enough.

C. Device Installation:
1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches (152 mm) in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.

6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.

D. Receptacle Orientation:
1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the right.
2. Install hospital-grade receptacles in patient-care areas with the ground pin or neutral blade at the top.
3. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
4. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.
5. Receptacle outlets shall accommodate connection of attachment plug of associated equipment.
6. Provide emergency (boiler) pushbutton at each exit door from boiler room.
7. Install blank faceplate on any j-box not having a device.
8. Provide tamper-resistant receptacles in all public waiting areas, public lounges, children's play areas, and all child care areas including educational (third grade and below), supervisory, pediatric locations (rooms, bathrooms, waiting rooms, playrooms, activity rooms), or personal care services. Per NEC 406.12-406.14, 406.2 (more than 4 children 7 years old or less), 517.18(C).
9. Provide tamper-resistant receptacles in all dwelling units and guest rooms.
10. Provide GFCI protection for receptacles in kitchens, at water coolers, within 6' of sink, outdoors, and where otherwise indicated on Drawings.
11. Provide weatherproof covers at all exterior receptacles, at interior wet or spray locations, and where otherwise indicated on Drawings.
12. GFCI receptacles shall not be installed behind equipment (refrigeration, vending, etc). Place receptacle where cord is accessible or provide the ground fault protection at the breaker.

3.02 IDENTIFICATION

A. Comply with Division 26 Section "Identification for Electrical Systems."

3.03 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.
1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.

B. Tests for Convenience Receptacles:
1. Line Voltage: Acceptable range is 105 to 132 V.
2. Voltage Drop: See Specification Section 26 0519. Voltage drop higher than 3 percent is not acceptable.
3. Ground Impedance: Refer to section "Grounding and Bonding for Electrical Systems"
4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
5. Using the test plug, verify that the device and its outlet box are properly wired and securely mounted.
6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar

problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

7. Provide checks on 10% of total quantity of receptacle branch circuits, to be coordinated with Engineer and focusing on worst case branch circuits.

END OF SECTION

SECTION 26 2816

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Nonfusible switches
   2. Receptacle switches
   3. Shunt trip switches
   4. Molded-case circuit breakers (MCCBs)
   5. Enclosures

1.03 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

1.04 SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
   1. Enclosure types and details for types other than NEMA 250, Type 1.
   2. Current and voltage ratings.
   3. Short-circuit current ratings (interrupting and withstand, as appropriate).
   4. Include evidence of NRTL listing for series rating of installed devices.
   5. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
   6. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.
   1. Wiring Diagrams: For power, signal, and control wiring.

C. Qualification Data: For qualified testing agency.

D. Field quality-control reports.
   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.

E. Manufacturer's field service report.

F. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
   1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
   2. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

1.05 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.
   1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.

B. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.

C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. Comply with NFPA 70.

1.06 COORDINATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following (match switchboard and/or panelboard equipment manufacturer)
   1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
   2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
   3. Siemens Energy & Automation, Inc.
   4. Square D; a brand of Schneider Electric.

2.02 NONFUSIBLE SWITCHES

A. Type HD, Heavy Duty, Single Throw, 240and 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

B. Accessories (as indicated on drawings):
   1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
   2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
   3. Isolated Ground Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
   4. Auxiliary Contact Kit: Two NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
   5. Hookstick Handle: Allows use of a hookstick to operate the handle.
   6. Lugs: Mechanical type, suitable for number, size, and conductor material.
   7. Accessory Control Power Voltage: Remote mounted and powered; 24-V ac or 120-V ac as required.

2.03 MOLDED-CASE CIRCUIT BREAKERS

A. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.

B. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

C. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.

D. Ground-Fault, Circuit-Interrupter (GFCI) Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-30 mA trip).

E. Ground-Fault, Equipment-Protection (GFEP) Circuit Breakers: With Class B ground-fault protection (30-mA trip).

F. Features:
   1. Standard frame sizes, trip ratings, and number of poles.
   2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.
   3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.

G. Accessories (as indicated on drawings):
   1. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
   2. Accessory Control Power Voltage: Remote mounted and powered; 24-V ac or 120-V ac as required.

2.04 MOLDED-CASE SWITCHES

A. General Requirements: MCCB with fixed, high-set instantaneous trip only, and short-circuit withstand rating equal to equivalent breaker frame size interrupting rating.

B. Features:
   1. Standard frame sizes and number of poles.
   2. Lugs: Mechanical type, suitable for number, size, trip ratings, and conductor material.

C. Accessories (as indicated on drawings):
   1. Ground-Fault Protection: Comply with UL 1053; remote-mounted and powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
   2. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
   3. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
   4. Auxiliary Contacts: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic switch contacts, "b" contacts operate in reverse of switch contacts.
   5. Alarm Switch: One NO/NC contact that operates only when switch has tripped.
   6. Key Interlock Kit: Externally mounted to prohibit switch operation; key shall be removable only when switch is in off position.
   7. Zone-Selective Interlocking: Integral with ground-fault shunt trip unit; for interlocking ground-fault protection function.
   8. Electrical Operator: Provide remote control for on, off, and reset operations.
   9. Accessory Control Power Voltage: Remote mounted and powered; 24-V ac or 120-V ac as required.

2.05 MOTOR RATED TOGGLE SWITCHES

A. For single phase 120V motor loads: Toggle switches shall be horsepower rated, manual, non-reversing switches without overload protection (where overload protection is provided by other means).

B. Switches shall have enclosures suitable for their environment.

2.06 NON-MOTOR EQUIPMENT TOGGLE SWITCH

A. For single phase, 120V non-motor loads: Toggle switches as specified in Section 262726.

2.07 NON-MOTOR RATED TOGGLE SWITCH

A. For single phase, 120V non-motor loads: Toggle switches as specified in Section 262726.

2.08 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
   1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
   2. Outdoor Locations: NEMA 250, Type 3R.
   3. Kitchenand Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
   4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
   5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.
   6. Hazardous Areas Indicated on Drawings: NEMA 250, Type 9.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

C. Install fuses in fusible devices.

3.03 IDENTIFICATION

A. Comply with requirements in Division 26 Section "Identification for Electrical Systems."
   1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
   2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.04 FIELD QUALITY CONTROL

A. Acceptance Testing Preparation:
   1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
   2. Test continuity of each circuit.

B. Tests and Inspections:
   1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
   2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
   3. Perform the following infrared scan tests and inspections and prepare reports:
      a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.

b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each enclosed switch and circuit breaker 11 months after date of Substantial Completion.
c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

C. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.05 ADJUSTING

A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Division 26 Section "Power System Study".

END OF SECTION

SECTION 26 5100
INTERIOR LIGHTING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Interior LED lighting fixtures, LED modules, and drivers
   2. Exit signs.
   3. Lighting fixture supports.

1.03 DEFINITIONS

A. BF: Ballast factor.

B. CRI: Color-rendering index.

C. CU: Coefficient of utilization.

D. HID: High-intensity discharge.

E. LED: Light Emitting Diode

F. LED Module: Mulitple LED's on a single driver circuit

G. LER: Lighting Fixture efficacy rating.

H. Lighting Fixture: Complete lighting fixture, including ballast housing if provided.

I. RCR: Room cavity ratio.

1.04 SUBMITTALS

A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:
   1. Physical description of lighting fixture including dimensions.
   2. Energy-efficiency data.
   3. Life, output, and energy-efficiency data for LED Modules .
   4. Photometric data, in IESNA format, based on laboratory tests of each lighting fixture type, outfitted with LED Module, LED driver, and accessories identical to those indicated for the lighting fixture as applied in this Project.
      a. Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program (NVLAP) for Energy Efficient Lighting Products.
   5. LED Fixture Reports
      a. IESNA LM-79 Test Reports.
      b. IESNA LM-80 Test Reports.
      c. IESNA TM-21 Calculation.

B. Shop Drawings: Show details of nonstandard or custom lighting fixtures. Indicate dimensions, weights, methods of field assembly, components, features, and accessories.
   1. Wiring Diagrams: Power and control wiring.

C. Product Certificates: For each type of ballast or LED Driver for bi-level and dimmer-controlled fixtures, signed by product manufacturer.

D. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.
   1. Tabulated list of LED Fixture Type and associated LED Modules
   2. Warranties: Special warranties specified in this Section.

1.05 QUALITY ASSURANCE

A. Lighting Fixture Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7.

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.

C. Comply with NFPA 70.

1.06 COORDINATION

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

B. Coordinate with and help Owner in submitting available lighting rebates to local Utility.

1.07 WARRANTY

A. Special Warranty LED Drivers: Manufacturer's standard form in which LED driver manufacturer agrees to repair or replace Drivers that fail in materials or workmanship within specified warranty period.
   1. Warranty Period for LED Drivers: Five years from date of Substantial Completion.

B. Special Warranty for LED Modules: Manufacturer's standard form, made out to Owner and signed by lamp manufacturer agreeing to replace lamps that fail in materials or workmanship, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.
   1. Warranty Period: Five year(s) from date of Substantial Completion.

C. Special Warranty for LED Fixtures: Manufacturer’s standard form in which manufacturer of LED Lighting Fixture agrees to repair or replace components that fail in materials or workmanship within specified warranty period.
   1. Warranty to include but not be limited to:
      a. Fixture finish.
      b. LED Driver(s)
      c. LED Modules
      d. Replacement when more than 10% of LED sources in any module is defective or non-starting.
      e. Color shift.
   2. Warranty Period for Solid State Lighting Fixtures: Five years from date of Substantial Completion.
   3. Provide written copy of manufacturer’s warranty with lighting submittals.

1.08 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. LED Driver: One of each type.
   2. LED Module: 1% of each type and rating installed. Furnish at least one of each type

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Refer to Lighting Fixture Schedule on the drawings for Light Fixture manufacturers.

B. LED Driver Manufacturers: Subject to compliance with requirements, available manufacturers that can provide products (but are not limited to) the following:
   1. By manufacturer of lighting fixture as called out on drawings

2.02 LIGHTING FIXTURES AND COMPONENTS, GENERAL REQUIREMENTS

A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.

B. LED Fixtures: Comply with UL 8750 and UL 1598.

C. Metal Parts: Free of burrs and sharp corners and edges.

D. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.

E. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

F. Reflecting surfaces shall have minimum reflectance as follows, unless 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.

G. Plastic Diffusers, Covers, and Globes:
   1. As indicated in the Lighting Fixture Schedule on the drawngs.
   2. Lighting Diffusers: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
   3. Glass: Annealed crystal glass, unless otherwise indicated.

H. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
   1. Label shall include the following lamp and, ballast, LED Module, and LED Driver characteristics:
      a. "USE ONLY" and include specific lamp and/or LED Driver type.
      b. LED Driver type and nominal wattage.
      c. CCT and CRI for all Lighting Fixtures.

2.03 DRIVERS FOR LED LIGHTING FIXTURES

A. General Requirements:
   1. Efficiency per LM-79:
      a. Drivers capable of 50 watts or greater: 85 percent or higher
      b. Drivers capable of less than 50 watts less: 80 percent or higher
   2. Power Output: UL Class I or II output.
   3. Rated Driver Life: Shall match Light Engine Rated Life; 50,000 hours minimum.
   4. Rated Ambient Operating Temperature: Refer to Project Conditions called out in 260500.
   5. Operating Frequency: 60 Hz
   6. Power Factor: 0.90 or higher.
   7. Total Harmonic Distortion Rating: Less than 20 percent.
   8. Sound Rating: Class A
   9. Hazardous Substances: RoHS compliant.
   10. Operations:
      a. On/Off: Shall be rated for normal 120V or 277V switch operation as indicated on drawings.
      b. Dimming: Shall be compatible with industry standard dimming protocols as indicated on drawings or in section 260945 “Network Lighting Control System and Devices”
   11. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
   12. Radio Frequency Interference: Comply with FCC 47 CFR part 15 Class A (commercial).

2.04 EXIT SIGNS

A. Description: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:
   1. Lamps for AC Operation: LEDs, 70,000 hours minimum rated lamp life.

2.05 LED MODULES

A. Modules shall be designed to operate in the temperatures as called out in the Project Conditions in section 260500.

B. Lumen Output: As indicated on the fixture schedule.

C. LED Binning: Within a 3-step MacAdam ellipse.

D. Rated Module Life: Greater than 70 percent of initial lumens at 50,000 hours, per LM-79 and LM-80 testing.

E. Correlated Color Temperature (CCT): As indicated on the drawings with an allowed plus or minus 5% variance.

F. Color Rendering Index (CRI): As indicated for the specified CCT:
   1. CCT of 3000K to 3500K: Greater than or equal to 80.
   2. CCT of 4000K to 6500K: Greater than or equal to 70.

2.06 LIGHTING FIXTURE SUPPORT COMPONENTS

A. Comply with Division 26 Section "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.

B. As called out on the Lighting Fixture Schedule, or follow the minimum requirements below as in the applications as called out in Part 3 of this specification:
   1. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.
   2. Twin-Stem Hangers: Two, 1/2-inch (13-mm) steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.
   3. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage (2.68 mm)].
   4. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage (2.68 mm).
   5. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.
   6. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

PART 3 EXECUTION

3.01 INSTALLATION

A. Lighting fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.

B. Temporary Lighting: If it is necessary, and approved by Architect or Engineer, to use permanent Lighting Fixtures for temporary lighting, install and energize the minimum number of Lighting Fixtures necessary. When construction is sufficiently complete, remove the temporary Lighting Fixtures, disassemble, clean thoroughly, install new lamps, and reinstall.

C. Support for Lighting Fixtures in Suspended Ceilings: The grid shall not be used as a support element. Contractor shall support fixtures independently from structure.
   1. Install a minimum of four ceiling support system rods or wires for each fixture. Locate not more than 6 inches (150 mm) from lighting fixture corners.
   2. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch (20-mm) metal channels spanning and secured to ceiling tees.

D. Suspended Lighting Fixture Support:
   1. Refer to Lighting Fixture Schedule on plan drawings. If not designated, then the following shall apply:
      a. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
      b. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
      c. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.

E. Adjust aimable lighting fixtures to provide required light intensities at intended target. Refer to Lighting Fixture Schedule for requirements.

F. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

G. Install contactors and low-voltage track lighting transformers in NEMA 1 enclosures.

H. Light fixtures designated as night lights shall have at least one lamp (refer to plan drawings for requirements) that is unswitched.

3.02 FIELD QUALITY CONTROL

A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

B. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.03 STARTUP SERVICE

A. Burn-in all fixtures that require specific aging period to operate properly, prior to occupancy by Owner.

3.04 UTILITY REBATES

A. Coordinate with and help Owner in submitting available lighting rebates to local Utility.

3.05 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting aimable Lighting Fixtures to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose. Some of this work may be required after dark. Allot one man day (8 hours) for project.
   1. Adjust aimable Lighting Fixtures in the presence of Architect.

END OF SECTION

SECTION 27 0500

COMMON WORK RESULTS FOR COMMUNICATIONS

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. The work included in this section of the specifications consists of furnishing labor, equipment, supplies, and materials, unless otherwise specified, and in performing operations necessary for the installation of communication work as listed in the Instruction to Bidders and as required by these specifications and shown on the drawings, subject to the terms and conditions of the contract. The work shall also include the completion of details of communication work not mentioned or shown which are necessary for the successful operation of communication systems described on the drawings or required by these specifications.

B. Furnish and install all equipment described herein, and as shown on the plans, to provide complete and operating systems for the project. All necessary cabling for connection to active equipment shall be provided for a complete and working system. Unless noted otherwise, junction boxes, back-boxes, and conduit rough-in for devices will be provided by the Division 26 subcontractor as defined in the specifications. However, any special back-boxes required for Division 27 equipment shall be furnished by the Division 27 contactor to the Division 26 contractor for installation.

C. Section Includes:
   1. Definitions
   2. Substitutions
   3. Shop Drawings
   4. Payment Request Breakdown
   5. Project Record Drawings
   6. Operating and Maintenance Manuals
   7. Basic Requirements for Utility Service
   8. Project Conditions
   9. Permits
   10. Authority Having Jurisdiction Inspections
   11. Insurance
   12. Commissioning and Testing
   13. Guarantee/Warranty
   14. Common requirements for Communication Installation
   15. Cleaning and Protection
   16. Equipment Furnished by Owner
   17. Final Tests and Adjustments
   18. Instruction of Owners Employees

1.03 DEFINITIONS

A. Basic Contract definitions are as follows:
   1. Provide: The term "provide" means "to furnish and install, ready for the intended use and in complete operating condition."
   2. Install: The term "install" is used to describe operations at project site including the actual "unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations."

3. Directed: Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean "directed by the Engineer," "requested by the Engineer," and similar phrases.
4. Approve: The term "approved," where used in conjunction with the Engineer's action on the Contractor's submittals, applications and requests, is limited to the Engineer's duties and responsibilities as stated in the Conditions of the Contracts.
5. Indicated: The term "indicated" refers to graphic representations, notes or schedules on the Drawings, or other Paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Where terms such as "shown," "noted," "scheduled and "specified" are used, it is to help the reader locate the reference; no limitation on location is intended.
6. Contractor: The term "Contractor" shall carry the same meaning as "Communications Contractor" or “Systems Integrator” or “Division 27 Contractor”.
7. Or Equal: The term "Or equal" shall carry the same meaning as "approved as equal by the Engineer"
8. Owner: All references here-in and on drawings to “Owner” shall be the same as “Duluth Transit Authority”.

1.04 QUALITY ASSURANCE

A. Materials, products, devices, fixtures, forms or types of construction included in this specification shall meet or exceed the requirements of National Electrical Code (NEC), American National Standards Institute (ANSI), Institute of Electrical and Electronics Engineers (IEEE) and National Manufacturing Association (NEMA), Building Industry Consulting Service International, Inc. (BICSI), Electronic Industries Alliance/Telecommunications Industry Association (EIA/TIA), and the applicable local Codes.
   1. 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.
   2. All communication workers on this project shall be thoroughly knowledgeable of all applicable codes related to all communication systems for this project. All installations shall be performed by skilled tradesmen fully aware of the latest techniques, practices, and standards of the industry. Haphazard or poor installation practice as determined by the Architect or Engineer will be cause for rejection of work.
   3. Good workmanship and appearance shall be required. Carefully lay out all work in advance to install in a neat and good workmanship-like manner all in accordance with recognized practices and standards of the industry.

1.05 COORDINATION

A. All drawings, specifications and documents for this project shall be taken as a whole. Prior to installation, the Contractor shall be familiar with this project by carefully reviewing and comparing all documents that pertain to this project.

B. In preparation of the contract documents, a reasonable effort has been made to provide layouts and connections based on selected and specified manufacturer's equipment. Since physical space, connections, equipment arrangements and other requirements may vary according to each manufacturer, the final responsibility for connections, initial access and proper fit is the responsibility of the Contractor.

C. Coordinate chases, slots, inserts, sleeves, and openings with general construction work and arrange in building structure during progress of construction to facilitate the electrical installations that follow.

D. Sequence, coordinate, and integrate installing materials and equipment for efficient flow of the Work. Coordinate installing large equipment requiring positioning before closing in the building.

E. Prior to roughing in for communication equipment furnished by others, verify the voltage and current characteristics and control connections of this equipment. Notify the Engineer where equipment connection requirements do not match the provisions indicated on the documents.

F. Provide, locate, and coordinate location of access panels and doors for communication items that are concealed by finished surfaces. Locations of access panels to be provided to the general contractor prior to shop drawing submittals to the Architect/Engineer for coordination purposes. Access panel requirements are located in the Division 8 specifications.

G. Where identification devices are applied to field-finished surfaces, coordinate installation of identification devices with completion of finished surface.

H. Where identification markings and devices will be concealed by acoustical ceilings and similar finishes, complete installation of these items prior to ceiling tile installation.

I. The drawings indicate only the approximate locations of rough-ins and may not indicate complete connection requirements. Prior to proceeding with any work or rough-ins the Contractor shall obtain all equipment rough-in requirements and information from the equipment supplier, manufacturer or from the respective trades furnishing the equipment or with Architect, to complete the installation in a neat and workmanship-like manner.

J. Scaled and calculated locations are approximate only. Before proceeding with work, carefully check and verify with building dimensions on architectural drawings, and be responsible for properly fitting equipment and materials together and to the structure in spaces provided.

K. Drawings are essentially diagrammatic and indicate the general arrangement of equipment. Many offsets, bends, pull boxes, special fittings, etc. will be required which are not indicated. Carefully study drawings and premises in order to determine best methods, exact locations, conduit routes, building obstructions, etc., to install apparatus and equipment. Install apparatus and equipment in manner and locations to avoid obstructions, preserve headroom, maintain code required clearances, and keep openings and passageways clear.

L. Where outlet boxes are located adjacent and opposite side of the same wall, the outlet boxes shall not be placed back to back, nor shall extension rings be used in place of double boxes, all to limit sound transmission between rooms. Provide short horizontal nipple between adjacent outlet boxes, which shall have depth sufficient to maintain wall coverage in rear by masonry material.

M. Where outlet boxes are located adjacent and opposite side of the same wall, the outlet boxes shall be rated or additional material (puddy, UL Listed Assembly, etc.) provided to maintain the indicated fire and/or smoke rating as indicated on the Architectural documents or meeting existing ratings.

N. Where outlet boxes are not provided with a device, whether new or existing, contractor shall provide a covering faceplate. No outlet box shall be left without a covering faceplate.

O. Coordinate arrangement, mounting, and support of communication equipment:
   1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
   2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
   3. To allow right of way for piping and conduit installed at required slope.
   4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.
   5. To maintain access to user serviceable equipment.
   6. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

P. Utility use charges
   1. Division 27 contractor is responsible for all temporary communication installation costs.

Q. Permit and Inspection Fees
   1. Secure regular inspections as required by State and local regulations. Pay charges by regulating agencies for Drawings, Specifications, review of Drawings and Specifications, and the inspections of installations.
   2. Communications contractor shall pay all fees for permits, licensing, and inspections applicable to the work of Division 27.
   3. Contractor shall pay all charges and fees levied by the serving utility and include these charges in the bid.

1.06 SUBMITTALS

A. General: Follow the procedures specified in Division 1 Sections.

B. Substitutions:
   1. Submittal dates: For a period as stated in Division 1 sections, Engineer will consider written requests from bidders, manufacturers, and suppliers for substitution of products.
   2. Submission: Submit a separate request for each product, supported with descriptions, drawings and samples as appropriate, including:
      a. Comparison of the qualities of the proposed substitution with that specified. Standard features and options of the proposed substitution shall be clearly identified on the submittal.
      b. Changes required in other elements of the work because of the substitution.
      c. Availability of maintenance service, and source of replacement materials.
      d. Substitution request constitutes a representation that bidder submitting request:
         1) Has investigated the proposed product and determined that it is equal to or superior in all respects to that specified.
         2) Will provide the same warranties or bonds for the substitution as for the product specified.
         3) Will coordinate the installation of an accepted substitution into the Work, and make such other changes as may be required to make the Work complete in all respects.
         4) Waives all claims for additional costs, under his responsibility which may subsequently become apparent.
      e. Engineer Review: The Engineer will review requests for substitutions with reasonable promptness to judge the acceptability of the proposed substitution, and notify bidders by addendum the decision to accept the requested substitution.
      f. Late Request for Substitutions: Requests for substitution received after bidding will not be considered except in such cases where it is necessary to make a substitution due to strikes, lockouts, bankruptcy, discontinuing of a product, etc. Requests for such substitutions of materials after award of contract shall be made in writing to Engineer and shall be made within ten days of date that Contractor ascertains he cannot obtain material or equipment specified.
      g. Engineer's Acceptance: Engineer's acceptance of a substituted item applies only to the general quality and arrangement of the items substituted. Substituted items are still subject to the shop drawing review process.

C. Shop Drawings:
   1. Before ordering any equipment, stamp with approval, and submit to the Engineer the number of copies required for the contractor's use, plus (1) one copy to be retained by the Engineer.
   2. The review of shop drawings by the Architect/Engineer shall not constitute agreement of any deviations from the plans and specifications and shall not relieve the Contractor from responsibility for errors or omissions.
   3. Shop drawings shall be in electronic copy format as follows:

a. A digital copy of shop drawings (Adobe Acrobat Portable Document Format - *.pdf – is preferred content format).
b. Submit the following and refer to each Section for specific requirements. Create a folder structure that follows the Section Numbering System, sequenced in order of section. The folders shall consist of the following:

4. The review of shop drawings by the Architect/Engineer shall not constitute agreement of any deviations from the plans and specifications and shall not relieve the Contractor from responsibility for errors or omissions.
5. Shop drawings shall be in electronic copy format as follows:
   a. A digital copy of shop drawings (Adobe Acrobat Portable Document Format - *.pdf – is preferred content format).
   b. Refer to drawings for the additional required equipment that is to be submitted as part of the shop drawing submittals.

D. Payment Request Breakdown:
1. For the purpose of establishing a schedule of values to be used for Application and Certification for Payments as defined in the General Conditions of the specifications, the items of electrical work shall be broken down per the following schedule. Each item of schedule shall contain its proper share of overhead and profit and shall be broken into a labor and material figure.
   a. Conduits - 1" and larger
   b. Conduits - 1/2" and 3/4"
   c. Wiring devices
   d. Equipment Room Fittings
   e. Horizontal Cabling
   f. Miscellaneous
2. Project Record Documents:
   a. As work progresses: Record changes or deviations from the contract drawings as follows:
      1) Record location and elevation of underground conduits and direct burial wiring.
      2) Record as-built changes for communication work within the building that occur during the progress of construction and before the work is concealed. Record shall include such changes as:
      3) Relocation of devices to avoid obstacles.
      4) Routing of conduit from outlet to outlet.
      5) Routing of conduit under floor, overhead, in walls or exposed.
      6) Combining of circuits into common conduit.
      7) Sizes of conduits and conductors.
   b. Location: The record drawings shall be maintained at the job site and be subject to review by the Owner or Engineer during the construction period. Prints for this purpose may be obtained from the Architect at cost. This record keeping requirement shall not be construed as authorization for the Contractor to make changes in the layout without definite instructions by the Architect/Engineer in each case.
   c. Submission: Upon completion of the work, a set of drawings showing changes as noted on the record set of prints shall be submitted to the Construction Manager.
3. Operating and Maintenance Manuals:
   a. Submittal: At the completion of the contract submit to the Engineer sets of operating and maintenance manuals including parts lists bound into hard covered manuals for the electrical equipment. Each manual to include an electronic data disk of the entire operating and maintenance manual with folder structure and naming to match tabs in the manual. Manuals shall be labeled with the local supplier's name and address. Information not definitely applying to these particular pieces of equipment shall be

crossed out or deleted from the submission. Information shall be included for equipment for which shop drawings have been provided.

b. Content:
   1) Approved shop drawings or product data sheets alone are not to be considered as acceptable maintenance material. Most items of equipment are shipped with installation/maintenance sheets included in the shipping package which shall also be included into the maintenance manual.
   2) Special warranties.
c. All test and commissioning data of each and every system as called out herein after being reviewed by the Engineer.
d. Hazardous Materials: Disposal Certificates.

1.07 PROJECT CONDITIONS

A. Exterior Environmental Conditions: Electrical systems shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:
   1. Ambient Temperature: Temperature ranges at the Project location as determined by the U.S. Weather Bureau.
   2. Altitude: 1362 feet above sea level

B. Interior Environmental Conditions: Electrical systems shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:
   1. Ambient Temperature: 72 to 75 deg F (conditioned spaces), 55 deg F to ambient (unconditioned spaces).
   2. Relative Humidity: 0 to 95 percent.

1.08 PERMITS

A. Obtain and pay fees for all licenses, required permits, and charges for use of outside services (i.e. inspecting agencies or delivery services) and use of property other than the site of the Work for storage of materials or other purposes.

1.09 AUTHORITY HAVING JURISDICTION INSPECTIONS

A. Secure regular inspections as required by State and local regulations. Pay charges by regulating agencies for Drawings, Specifications, review of Drawings and Specifications, and the inspections of installations.

1.10 INSURANCE

A. Procure and maintain such insurance required by law and additional insurance, as specified in Division 0 or 1, or by Construction Manager.

1.11 COMMISSIONING AND TESTING:

A. Provide field Commissioning and testing (as defined in the referenced specification, results shall be included within O&M Manual submittal binders) for the following Specification Sections:
   1. 271500 Communication Horizontal Cabling

1.12 GUARANTEE/WARRARNTY

A. The communication system installed under this contract shall be left in proper working order. Replace, without additional charge, new work or material which develops defects from ordinary use within one year unless a longer period is specified elsewhere, from substantial completion, except materials not furnished by the Contractor.

B. New materials and equipment shall be guaranteed against defects in composition, design or workmanship. Guarantee certificates shall be furnished on special equipment, indicated.

C. Special guarantee/warranty provisions, for certain work, are set forth in the following Sections:
   1. 271500 Communication Horizontal Cabling

PART 2 - NOT APPLICABLE

PART 3 EXECUTION

3.01 COMMON REQUIREMENTS FOR COMMUNICATION INSTALLATION

A. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

B. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

D. Right of Way: Give to piping systems installed at a required slope.

3.02 PENETRATION FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Division 07 Sections.
   1. General Requirements:
      a. Provide penetration fire stopping 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 fire stopping 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 fire stopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
         1) Fire-resistance-rated walls include fire walls, fire-barrier walls, smoke-barrier walls, and fire partitions.
         2) F-Rating: Not less than the fire-resistance rating of constructions penetrated.
      c. Penetrations in Horizontal Assemblies: Provide penetration fire stopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).
         1) Horizontal assemblies include floors, floor/ceiling assemblies, and ceiling membranes of roof/ceiling assemblies.
         2) F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated. T-rating in subparagraph below indicates resistance to excessive thermal transmission.
         3) T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
      d. Penetrations in Smoke Barriers: Provide penetration fire stopping with ratings determined per UL 1479.
      e. Accessories: Provide components for each penetration fire stopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration fire stopping manufacturer and approved by qualified testing and inspecting agency for fire stopping 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.
            (e) Temporary forming materials.

(f) Substrate primers.
(g) Collars.
(h) Steel sleeves.

2. 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.

3. Mixing:
   a. For those products requiring mixing before application, comply with penetration fire stopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

4. Installation:
   a. General: Install penetration fire stopping 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 fire stopping 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.

d. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.03 DEMOLITION RESPONSIBILITIES

A. Resupport or Removal: For communication and life safety and security equipment to be demolished; remove accessible wiring including conduit, junction boxes, hangers and supports for backbone conduits, horizontal cabling from patch panels or punch down blocks to communication or life safety and security devices indicated to be removed. Existing conduit, boxes, cable, etc. indicated to remain which are presently being supported from existing ceilings or walls to be removed, shall be temporarily supported to building structure then reinstalled in new ceilings or walls.

B. Patching: Where conduits are stubbed out of a surface not being removed for new construction, such as a floor slab or poured concrete column or wall, these conduits must be cut back to a point where patching can adequately be performed.

C. Coordinate with Owner: Demolition work shall be coordinated with the Owner. Should questions arise regarding the removal of a conduit and/or wiring, (i.e. Is it energized? Does it serve a load in an area not be remodeled?), confer with the Owner before such wiring or conduit is actually demolished.

D. Salvaged, Reused and Reinstalled equipment and devices: Carefully disconnect and removed items to be salvaged, reused or reinstalled. Any questions regarding the quality and reusability of an item shall be brought to the attention of the Engineer/Architect prior to removal. Items shall be properly stored in a manner causing no additional damage to the item. Prior to reinstalling, clean and test item. Upon completion, the item shall be in equivalent condition as prior to its removal. Items damaged due to improper handling and storage by the Contractor shall be replaced with new items of the same type and quality as the original item. Salvaged items to be turned over to the Owner as described in this specification section and on plans.

E. Demolition equipment and devices: Existing equipment and devices not indicated for reuse or salvage shall [become the property of this Contractor, unless indicated otherwise, and disposed of properly.

3.04 CUTTING AND PATCHING

A. Provide cutting and patching in conformance the following 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
2. 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. Other construction elements include but are not limited to the following:
   a. Water, moisture, or vapor barriers.
   b. Membranes and flashings.
   c. Exterior curtain-wall construction.
   d. Sprayed fire-resistive material.
   e. Equipment supports.
   f. Piping, ductwork, vessels, and equipment.
   g. Noise- and vibration-control elements and systems.

h. 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.

3.05 REFINISHING AND TOUCHUP PAINTING

A. Refinish and touch up paint:
1. Clean damaged and disturbed areas and apply primer, intermediate, and finish coats to suit the degree of damage at each location.
2. Follow paint manufacturer's written instructions for surface preparation and for timing and application of successive coats.
3. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
4. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.
5. Paint exposed conduits to match painted surfaces.

3.06 CLEANING AND PROTECTION

A. Progress Cleaning:
1. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
a. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
b. 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 (27 deg C).
c. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
d. Use containers intended for holding waste materials of type to be stored.
e. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
1) Site: Maintain Project site free of waste materials and debris.
2. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
a. Remove liquid spills promptly.
b. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
c. 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.
3. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
4. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
5. 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 Division 01 Sections.
6. 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.
7. 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.

8. 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.

B. Final Cleaning:
   1. Thoroughly clean electrical materials, equipment and apparatus to be free of dust, dirt, rust, and foreign materials before acceptance at Substantial Completion.
      a. Clean communication materials in conformance with manufacturer's instructions.
      b. Take special care to remove dirt, mortar, wire scraps, etc., from equipment interiors.
      c. Clean accessible elements of disconnecting and protective devices of equipment with compressed air (less than 15 psi) and vacuum clean enclosure prior to being energized.
      d. On completion of installation, including outlets, fittings, and devices, inspect exposed finish. Remove burrs, dirt, paint spots, and construction debris.
      e. Protect equipment and installations and maintain conditions to ensure that coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.

3.07 EQUIPMENT FURNISHED BY THE OWNER

A. Contractor Requirement:
   1. Inspect in presence of the Owner's Representative, and report in writing, any damage.
      a. Assume responsibility for receiving, storing, protecting, installing, and connecting owner furnished equipment.

B. List of Owner furnished equipment:
   1. Equipment as indicated on the drawings.

3.08 INTERRUPTION OF EXISTING ELECTRIC OR COMMUNICATION SERVICE(S)

A. The existing building will be in use during construction. Schedule and carry out the Work in such a manner as to cause the Owner a minimum of inconvenience due to service interruption. Temporary services (feeder, branch circuit and signal systems) shall be installed if one area or phase of construction disrupts service to another area of the building(s) or if equipment, conduits, or feeders have to be relocated to allow construction to progress. Service interruptions shall be confined to the smallest area possible at any one time and interruptions shall be scheduled in advance with the Owner’s site representative. All interruptions shall be conducted and shall be limited to after hours [(9:00 pm – 6:00am)] and [weekends], or as directed by the Owner. After service has been restored following an interruption, inspect areas affected by the interruption and be responsible for returning automatically controlled equipment to the same operating condition which existed prior to the interruption.

B. Notify the Owner a minimum of 14 days prior to service interruption.

3.09 FINAL TESTS AND ADJUSTMENTS

A. Provide personnel for initial start-up and operation of the electrical equipment and for a trial run of the equipment to demonstrate that the equipment and associated systems are properly installed and operating as intended before the date of substantial completion.
   1. Upon completion, subject the work to such tests as are required under industry standards and/or specified herein. Acceptance of the work by Owner shall be contingent upon satisfactory completion of these tests.
   2. Subject the work to a careful and thorough visual inspection to detect erroneous or loose connections, damaged components, presence of foreign objects or materials, poor workmanship, incorrect ratings of overcurrent protective devices, or other abnormal conditions.

3.10 INSTRUCTION OF OWNERS EMPLOYEES

A. Provide the services of competent instructors, who will give full instructions in the care, adjustment, and operation of parts of the communication system and equipment to the Owner's employees who are to have charge of the equipment.
   1. Each instructor shall be thoroughly familiar with parts of the installation on which they are to give instructions and shall have full knowledge of the operating theory and practical operation-maintenance work. Factory trained instructors shall be employed wherever they are available.
   2. Instructions shall be given during the regular work week after the building has been accepted and turned over to the Owner for regular operation. In addition to the time indicated in other Division 27 sections, provide one day (8 hours) of instructions for general systems.
   3. The instructions shall be given within three months after the work has been accepted and turned over to the Owner at a time mutually agreed on with the Owner.
   4. Notify the Engineer in writing when such instruction has been completed.

END OF SECTION

SECTION 27 1500

COMMUNICATIONS HORIZONTAL CABLING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. UTP cabling:
      a. Category 6
      b. Category 6A (Wireless Access Point).
      c. Cable connecting hardware, patch panels, and cross-connects.
      d. Telecommunications outlet/connectors.
      e. Testing/Commissioning

1.03 DEFINITIONS

A. BICSI: Building Industry Consulting Service International.

B. Consolidation Point: A location for interconnection between horizontal cables extending from building pathways and horizontal cables extending into furniture pathways.

C. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.

D. EMI: Electromagnetic interference.

E. IDC: Insulation displacement connector.

F. LAN: Local area network.

G. MUTOA: Multiuser telecommunications outlet assembly, a grouping in one location of several telecommunications outlet/connectors.

H. Outlet/Connectors: A connecting device in the work area on which horizontal cable or outlet cable terminates.

I. RCDD: Registered Communications Distribution Designer.

J. UTP: Unshielded twisted pair.

1.04 HORIZONTAL CABLING DESCRIPTION

A. Horizontal cable and its connecting hardware provide the means of transporting signals between the telecommunications outlet/connector and the horizontal cross-connect located in the communications equipment room. This cabling and its connecting hardware are called a "permanent link," a term that is used in the testing protocols.
   1. TIA/EIA-568-B.1 requires that a minimum of two telecommunications outlet/connectors be installed for each work area.
   2. Horizontal cabling shall contain no more than one transition point or consolidation point between the horizontal cross-connect and the telecommunications outlet/connector.
   3. Bridged taps and splices shall not be installed in the horizontal cabling.
   4. A work area is approximately 100 sq. ft., and includes the components that extend from the telecommunications outlet/connectors to the station equipment.
   5. The maximum allowable horizontal cable length is 295 feet. This maximum allowable length does not include an allowance for the length of 16 feet to the workstation equipment or in the horizontal cross-connect.

1.05 SUBMITTALS

A. Product Data: For each type of product.

1. For each cable type, include the following installation data:
    a. Nominal OD
    b. Minimum bending radius
    c. Maximum pulling tension
    d. Maximum/Minimum temperatures for pulling
    e. Allowed lubricants for pulling
2. Shop Drawings:
    a. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by Owner.
    b. Cabling administration drawings and printouts.
    c. Wiring diagrams to show typical wiring schematics, including the following:
        1) Cross-connects.
        2) Patch panels.
        3) Patch cords.
    d. Cross-connects and patch panels. Detail mounting assemblies, and show elevations and physical relationship between the installed components.
3. Operating and Maintenance Manuals:
    a. Content:
        1) Approved shop drawings or product data sheets alone are not to be considered as acceptable maintenance material. Most items of equipment are shipped with installation/maintenance sheets included in the shipping package which shall also be included into the maintenance manual.
        2) Special warranties.
        3) All test and commissioning data of each and every system as called out herein after being reviewed by the Engineer.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.
    1. Layout Responsibility: Preparation of Shop Drawings shall be by a Level 2 Installer or greater.
    2. Installation Supervision: Installation shall be under the direct supervision of Level 2 Installer, who shall be present at all times when Work of this Section is performed at Project site.

1.07 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.
    1. Test each pair of UTP cable for open and short circuits.

1.09 COORDINATION

A. Coordinate layout and installation of telecommunications cabling with Owner's telecommunications and LAN equipment and service suppliers.

B. Coordinate telecommunications outlet/connector locations with location of power receptacles at each work area.

1.10 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
    1. Device Plates: 5 of each type.

PART 2 PRODUCTS

2.01 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:
   1. UTP Cabling/Connectivity:
      a. Berk Tek/Leviton (Basis of Design):
      b. Commscope/Commscope
      c. General/Panduit
      d. Siemon/Siemon (Basis of Design)
         1) Category 6 - System 6
         2) Category 6A - Category 6A UTP
   2. Cabling Hardware:
      a. Same as Connectivity Manufacturer.
   3. UTP Patch Panels
      a. Leviton
      b. Commscope
      c. Panduit
      d. Siemon
   4. End to End Solution shall include a minimum 15 year warranty on all installed products.

2.02 PERFORMANCE REQUIREMENTS

A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA/EIA-568-B.1 when tested according to test procedures of this standard.

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: 25 or less.
   2. Smoke-Developed Index: 50 or less.
   3. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   4. Grounding: Comply with J-STD-607-B.

2.03 UTP CABLE

A. Description: 100-ohm, 4-pair UTP, quantity as indicated on drawings.
   1. Comply with ICEA S-90-661 for mechanical properties.
   2. Comply with TIA/EIA-568-B.1 for performance specifications.
   3. Comply with TIA/EIA-568-C.2, Category 6
   4. Comply with TIA/EIA-568-C.2, Category 6A
   5. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:
      a. Communications, Plenum Rated: Type CMP, complying with NFPA 262.
      b. Under-slab Application: Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:
         1) Communications, Outdoor UV Rated, ANSI/ICEA S-90-661.

2.04 UTP CABLE HARDWARE

A. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-C.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.

B. Patch Panel: Modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.
   1. Number of Jacks per Field: One for each four-pair UTP cable indicated.

2. Jacks and Jack Assemblies: Modular, color-coded, eight-position modular receptacle units with integral IDC-type terminals.
3. Patch Cords / Station Cords: Factory-made, four-pair cables in lengths as indicated; terminated with eight-position modular plug at each end.
    a. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure Category 6 and 6A performance. Patch cords shall have latch guards to protect against snagging.
    b. Patch cords shall have color-coded boots for circuit identification.
    c. Provide the following:
        1) One (1) 84-inch patch and (1) 84-inch station cord for 5% of the total number of terminated outlets in each telecommunications space.
        2) One (1) 60-inch patch and (1) 60-inch station cord for 5% of the total number of terminated outlets in each telecommunications space.
        3) One (1) 36-inch patch and (1) 36-inch station cord for 20% of the total number of terminated outlets in each telecommunications space.
        4) One (1) 12-inch patch for 20% of the total number of terminated outlets in each telecommunications space.

2.05 TELECOMMUNICATIONS OUTLET/CONNECTORS

A. Jacks: 100-ohm, balanced, twisted-pair connector; four-pair, eight-position modular. Comply with TIA/EIA-568-B.1.

B. Workstation Outlets: Four-port-connector assemblies mounted in single faceplate.
    1. For use with snap-in jacks accommodating any combination of UTP, optical fiber, and coaxial work area cords.
        a. Flush mounting jacks, positioning the cord at a 45-degree angle.
        b. Legend: Factory labeled by silk-screening or engraving for stainless steel faceplates.
        c. Legend: Machine printed, in the field, using adhesive-tape label.
        d. Legend: Snap-in, clear-label covers and machine-printed paper inserts.

2.06 STRUCTURED CABLING SCHEME

	System	UTP	Cable	Outlet	Patch Cord	Station Cord
B.	Voice	Cat 6	Blue	Blue	Blue	Blue
C.	Data	Cat 6	Blue	Blue	Blue	Blue
D.	WAP	Cat 6A	Violet	Violet	Violet	Violet
E.	PA/IC/MN	--	--	--	--	--
F.	Security	Cat 6	Green	Green	Green	Green
G.	Fire Alarm	Cat 6	Red	Red	Red	Red

2.07 WALL PLATES

A. Single and combination types shall match corresponding wiring devices (below is for basis of bid).
    1. Plate-Securing Screws: Metal with head color to match plate finish.
    2. Material for Finished Spaces 0.035-inch- (1-mm-) thick, satin-finished, Type 302 stainless steel.
    3. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.
    4. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

2.08 FINISHES

A. Refer to Division 26 section “Wiring Devices” for requirements.

2.09 GROUNDING

A. Comply with requirements in Section 26 05 26 "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.

B. Comply with J-STD-607-B.

2.10 IDENTIFICATION PRODUCTS

A. Comply with TIA/EIA-606-A and UL 969 for labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

B. Comply with requirements in Section 26 05 53 "Identification for Electrical Systems."

2.11 SURGE PROTECTION DEVICES

A. EIA/TIA 19-inch mountable panel with 12 open ports for RJ45 (Non PoE and PoE) and BNC outlets.

2.12 SOURCE QUALITY CONTROL

A. Factory test UTP on reels according to TIA/EIA-568-B.1.

B. Factory test UTP cables according to TIA/EIA-568-C.2.

C. Factory-sweep test coaxial cables at frequencies from 5 MHz to 1 GHz. Sweep test shall test the frequency response, or attenuation over frequency, of a cable by generating a voltage whose frequency is varied through the specified frequency range and graphing the results.

D. Cable will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

PART 3 EXECUTION

3.01 WIRING METHODS

A. Install cables in pathways except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Conceal pathways and cables except in unfinished spaces.
   1. Comply with requirements in Section 26 05 20 "Pathways for Communications Systems."
   2. Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
   3. Wiring within Enclosures:
      a. Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.
      b. Install lacing bars and distribution spools.
      c. Install conductors parallel with or at right angles to sides and back of enclosure.

3.02 INSTALLATION OF CABLES

A. Refer to with requirements in Section 26 05 20 "Pathways for Communications and Safety and Security" for installation of conduits and wireways.

B. General Requirements for Cabling:
   1. Comply with TIA/EIA-568-B.1.
   2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
   3. Install 110-style IDC termination hardware unless otherwise indicated.
   4. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
   5. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
   6. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.

7. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
8. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
9. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
10. In the communications equipment room, install a 10-foot long service loop on each end of cable.
11. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.
12. UTP Cable Installation:
    a. Comply with TIA/EIA-568-B.2.
    b. Do not untwist UTP cables more than recommended by the manufacturer (maximum of 1/2 inch) from the point of termination to maintain cable geometry.
13. Open-Cable Installation:
    a. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
    b. Suspend UTP cable not in a wireway or pathway, a minimum of 8 inches above ceilings by cable supports not more than 60 inches apart.
    c. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.
14. Group connecting hardware for cables into separate logical fields.
15. Separation from EMI Sources:
    a. Comply with BICSI TDMM and TIA/EIA-569-A recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
    b. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
        1) Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
        2) Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
        3) Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.
    c. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
        1) Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
        2) Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
        3) Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.
    d. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
        1) Electrical Equipment Rating Less Than 2 kVA: No requirement.
        2) Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
        3) Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.
    e. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
    f. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.03 FIRESTOPPING

A. Comply with requirements in Section 07 84 13 "Penetration Firestopping."

B. Comply with TIA-569-B, Annex A, "Firestopping."

C. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.04 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."
   1. Administration Class: 2
   2. Color-code cross-connect fields. Apply colors to voice and data service backboards, connections, covers, and labels.
   3. Develop Cabling Administration Drawings for system identification, testing, and management. Use unique, alphanumeric designation for each cable and label cable, jacks, connectors, and terminals to which it connects with same designation. At completion, cable and asset management software shall reflect as-built conditions.
   4. Comply with requirements in Section 09 91 23 "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.
   5. Paint and label colors for equipment identification shall comply with TIA/EIA-606-A for Class 2 level of administration.
   6. Cable Schedule: Post in prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.
   7. Cabling Administration Drawings: Show building floor plans with cabling administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, entrance pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors. Follow convention of TIA/EIA-606-A. Furnish electronic record of all drawings, in software and format selected by Owner.
   8. Cable and Wire Identification:
      a. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
      b. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
      c. Exposed Cables and Cables in Surface Raceways: Label each cable at intervals not exceeding 25 feet.
      d. Label each terminal strip and screw terminal in each cabinet, rack, or panel.
         1) Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with name and number of particular device as shown.
         2) Label each unit and field within distribution racks and frames.
      e. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
   9. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA-606-A.
      a. Cables use flexible vinyl or polyester that flex as cables are bent.

3.05 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
   1. Visually inspect UTP jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-B.1.
   2. Visually confirm Category rating, marking of outlets, cover plates, outlet/connectors, and patch panels.
   3. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
   4. Document data for each measurement. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.
   5. End-to-end cabling will be considered defective if it does not pass tests and inspections.
   6. Prepare test and inspection reports.

3.06 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel in cable-plant management operations, including changing signal pathways for different workstations, rerouting signals in failed cables, and keeping records of cabling assignments and revisions when extending wiring to establish new workstation outlets.

END OF SECTION

SECTION 28 0500

COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section Includes:
   1. Electronic safety and security equipment coordination and installation.
   2. Common electronic safety and security installation requirements.

1.03 DEFINITIONS

A. EPDM: Ethylene-propylene-diene terpolymer rubber.

B. NBR: Acrylonitrile-butadiene rubber.

1.04 COORDINATION

A. Coordinate arrangement, mounting, and support of electronic safety and security equipment:
   1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
   2. To provide for ease of disconnecting the equipment with minimum interference to other installations.
   3. To allow right of way for piping and conduit installed at required slope.
   4. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

C. Coordinate location of access panels and doors for electronic safety and security items that are behind finished surfaces or otherwise concealed.

D. Coordinate sleeve selection and application with selection and application of firestopping.

PART 2 PRODUCTS [NOT APPLICABLE]

PART 3 EXECUTION

3.01 COMMON REQUIREMENTS FOR ELECTRONIC SAFETY AND SECURITY INSTALLATION

A. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

B. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

C. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electronic safety and security equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

D. Right of Way: Give to piping systems installed at a required slope.

3.02 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electronic safety and security installations to restore original fire-resistance rating of assembly.

END OF SECTION

SECTION 28 4600
FIRE DETECTION AND ALARM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire alarm system design and installation, including all components, wiring, and conduit.

B. Replacement and removal of existing fire alarm system components, wiring, and conduit indicated.

1.02 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping: Materials and methods for work to be performed by this installer.

1.03 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

C. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Corrigendum 2012).

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. NFPA 72 - National Fire Alarm and Signaling Code; Most Recent Edition Cited by Referring Code or Reference Standard.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Evidence of designer qualifications.

C. Design Documents: Submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, riser diagrams, and description of operation:

1. Copy (if any) of list of data required by authority having jurisdiction.
2. NFPA 72 "Record of Completion", filled out to the extent known at the time.
3. Clear and concise description of operation, with input/output matrix similar to that shown in NFPA 72 Appendix A-7-5-2.2(9), and complete listing of software required.
4. System zone boundaries and interfaces to fire safety systems.
5. Location of all components, circuits, and raceways; mark components with identifiers used in control unit programming.
6. Circuit layouts; number, size, and type of raceways and conductors; conduit fill calculations; spare capacity calculations; notification appliance circuit voltage drop calculations.
7. List of all devices on each signaling line circuit, with spare capacity indicated.
8. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.
9. Description of power supplies; if secondary power is by battery include calculations demonstrating adequate battery power.
10. Certification by either the manufacturer of the control unit or by the manufacturer of each other component that the components are compatible with the control unit.
11. Certification by the manufacturer of the control unit that the system design complies with Contract Documents.
12. Certification by Contractor that the system design complies with Contract Documents.
13. Do not show existing components to be removed.

D. Evidence of installer qualifications.

E. Evidence of maintenance contractor qualifications, if different from installer.

F. Inspection and Test Reports:
   1. Submit inspection and test plan prior to closeout demonstration.
   2. Submit documentation of satisfactory inspections and tests.
   3. Submit NFPA 72 "Inspection and Test Form," filled out.

G. Operating and Maintenance Data: See Section 01 7800 for additional requirements; revise and resubmit until acceptable; have one set available during closeout demonstration:
   1. Complete set of specified design documents, as approved by authority having jurisdiction.
   2. Additional printed set of project record documents and closeout documents, bound or filed in same manuals.
   3. Contact information for firm that will be providing contract maintenance and trouble call-back service.
   4. List of recommended spare parts, tools, and instruments for testing.
   5. Replacement parts list with current prices, and source of supply.
   6. Detailed troubleshooting guide and large scale input/output matrix.
   7. Preventive maintenance, inspection, and testing schedule complying with NFPA 72; provide printed copy and computer format acceptable to Owner.
   8. Detailed but easy to read explanation of procedures to be taken by non-technical administrative personnel in the event of system trouble, when routine testing is being conducted, for fire drills, and when entering into contracts for remodeling.

H. Project Record Documents: See Section 01 7800 for additional requirements; have one set available during closeout demonstration:
   1. Complete set of floor plans showing actual installed locations of components, conduit, and zones.
   2. "As installed" wiring and schematic diagrams, with final terminal identifications.
   3. "As programmed" operating sequences, including control events by device, updated input/output chart, and voice messages by event.

I. Closeout Documents:
   1. Certification by manufacturer that the system has been installed in compliance with manufacturer's installation requirements, is complete, and is in satisfactory operating condition.
   2. NFPA 72 "Record of Completion", filled out completely and signed by installer and authorized representative of authority having jurisdiction.
   3. Certificate of Occupancy.

1.05 QUALITY ASSURANCE

A. Designer Qualifications: NICET Level III or IV (3 or 4) certified fire alarm technician or registered fire protection engineer, employed by fire alarm control panel manufacturer, Contractor, or installer, with experience designing fire alarm systems in the jurisdictional area of the authorities having jurisdiction.

B. Installer Qualifications: Firm with minimum 3 years documented experience installing fire alarm systems of the specified type and providing contract maintenance service as a regular part of their business.
   1. Authorized representative of control unit manufacturer; submit manufacturer's certification that installer is authorized; include name and title of manufacturer's representative making certification.
   2. Installer Personnel: At least 2 years of experience installing fire alarm systems.
   3. Supervisor: NICET level III or IV (3 or 4) certified fire alarm technician; furnish name and address.

C. Maintenance Contractor Qualifications: Same entity as installer or different entity with specified qualifications.

1.06 WARRANTY

A. Provide control panel manufacturer's warranty that system components other than wire and conduit are free from defects and will remain so for 1 year after date of Substantial Completion.

B. Provide installer's warranty that the installation is free from defects and will remain so for 1 year after date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Initiating Devices and Notification Appliances:
   1. Honeywell Security & Fire Solutions/Gamewell-FCI: www.gamewell-fci.com/#sle.
   2. Honeywell Security & Fire Solutions/Fire-Lite: www.firelite.com/#sle.
   3. Honeywell Security & Fire Solutions/Notifier: www.notifier.com/#sle.
   4. Honeywell Security & Fire Solutions/Silent Knight: www.silentknight.com/#sle.
   5. Honeywell Security & Fire Solutions/Vista: www.security.honeywell.com/#sle.
   6. Simplex, a brand of Johnson Controls: www.simplex-fire.com/#sle.
   7. Same manufacturer as control units.
   8. Provide initiating devices and notification appliances made by the same manufacturer, where possible.

2.02 FIRE ALARM SYSTEM

A. Fire Alarm System: Provide modifications and extensions to the existing automatic fire detection and alarm system:
   1. Provide all components necessary, regardless of whether shown in Contract Documents or not.
   2. Protected Premises: Entire building shown on drawings.
   3. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:
      a. ADA Standards.
      b. The requirements of the local authority having jurisdiction.
      c. Applicable local codes.
      d. Contract Documents (drawings and specifications).
      e. NFPA 72; where the word "should" is used consider that provision mandatory; where conflicts between requirements require deviation from NFPA 72, identify deviations clearly on design documents.
   4. Voice Notification: Provide emergency voice/alarm communications with multichannel capability; digital.
   5. General Evacuation Zones: Each smoke zone is considered a general evacuation zone unless otherwise indicated, with alarm notification in all zones on the same floor, on the floor above, and the floor below.

B. Circuits:
   1. Initiating Device Circuits (IDC): Class B, Style A.
   2. Signaling Line Circuits (SLC) Within Single Building: Class B, Style 0.5.
   3. Notification Appliance Circuits (NAC): Class B, Style W.

C. Power Sources:
   1. Primary: Dedicated branch circuits of the facility power distribution system.
   2. Secondary: Storage batteries.
   3. Capacity: Sufficient to operate entire system for period specified by NFPA 72.
   4. Each Computer System: Provide uninterruptible power supply (UPS).

2.03 EXISTING COMPONENTS

A. Existing Fire Alarm System: Remove existing components indicated and incorporate remaining components into new system, under warranty as if they were new; do not take existing portions of system out of service until new portions are fully operational, tested, and connected to existing system.

B. Clearly label components that are "Not In Service."

C. Remove unused existing components and materials from site and dispose of properly.

2.04 COMPONENTS

A. General:
   1. Provide flush mounted units where installed in finish areas; in unfinished areas, surface mounted unit are acceptable.
   2. Provide legible, permanent labels for each control device, using identification used in operation and maintenance data.

B. Fire Alarm Control Units: Analog, addressable type; listed, classified, and labeled as suitable for the purpose intended.

C. Master Control Unit: As specified for Basis of Design above, or equivalent.

D. Initiating Devices:
   1. Addressable Systems:
      a. Addressable Devices: Individually identifiable by addressable fire alarm control unit.
      b. Provide suitable addressable interface modules as indicated or as required for connection to conventional (non-addressable) devices and other components that provide a dry closure output.
   2. Smoke Detectors: quantity indicated on drawings.
   3. Heat Detectors: quantity indicated on drawings.

E. Notification Appliances:
   1. Speakers: quantity indicated on drawings.
      a. Provide 1 extra.
   2. Strobes: quantity indicated on drawings.
      a. Provide 1 extra.

F. Circuit Conductors: Copper or optical fiber; provide 200 feet extra; color code and label.

G. Surge Protection: In accordance with IEEE C62.41.2 category B combination waveform and NFPA 70; except for optical fiber conductors.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with applicable codes, NFPA 72, NFPA 70, and Contract Documents.

B. Conceal all wiring, conduit, boxes, and supports where installed in finished areas.

C. Obtain Owner's approval of locations of devices, before installation.

D. Install instruction cards and labels.

3.02 INSPECTION AND TESTING FOR COMPLETION

A. Notify Owner 7 days prior to beginning completion inspections and tests.

B. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.

C. Provide the services of the installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.

D. Prepare for testing by ensuring that all work is complete and correct; perform preliminary tests as required.

E. Provide all tools, software, and supplies required to accomplish inspection and testing.

F. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.

G. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

3.03 CLOSEOUT

A. Closeout Demonstration: Demonstrate proper operation of all functions to Owner.
   1. Be prepared to conduct any of the required tests.
   2. Have at least one copy of operation and maintenance data, preliminary copy of project record drawings, input/output matrix, and operator instruction chart(s) available during demonstration.
   3. Have authorized technical representative of control unit manufacturer present during demonstration.
   4. Demonstration may be combined with inspection and testing required by authority having jurisdiction; notify authority having jurisdiction in time to schedule demonstration.
   5. Repeat demonstration until successful.

3.04 MAINTENANCE

A. See Section 01 7000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

B. Perform routine inspection, testing, and preventive maintenance required by NFPA 72, including:
   1. Maintenance of fire safety interface and supervisory devices connected to fire alarm system.
   2. Repairs required, unless due to improper use, accidents, or negligence beyond the control of the maintenance contractor.
   3. Record keeping required by NFPA 72 and authorities having jurisdiction.

C. Maintain a log at each fire alarm control unit, listing the date and time of each inspection and call-back visit, the condition of the system, nature of the trouble, correction performed, and parts replaced. Submit duplicate of each log entry to Owner's representative upon completion of site visit.

D. Comply with Owner's requirements for access to facility and security.

END OF SECTION