Project Manual

Lake Forest Library - 1931 Historic Rooms Revitalization

360 E. Deerpath Road, Lake Forest, Illinois

Issued for Bid



October 20, 2026

VHA #2504-F

PREPARED FOR:
Lake Forest Library
360 E. Deerpath Road
Lake Forest, Illinois 60045

PREPARED BY:
Vinci | Hamp Architects, Inc.
1147 W. Ohio Street, Suite 600
Chicago, Illinois 60642
(312) 733 - 7744
https://vinci-hamp.com

VHA VINCI | HAMP ARCHITECTS

LAKE FOREST LIBRARY

PART 1 GENERAL

1.1 SECTION INCLUDES
A. Identification of project team members and their contact information.

1.2 OWNER:
A. LAKE FOREST LIBRARY
360 E Deerpath Road
Lake Forest, IL 60045
(847) 234-0636
B. Contact:
Molly Scheibler, Executive Director
mscheibler@lakeforestlibrary.org; (847) 810-4602

1.3 ARCHITECT:
A. All correspondence from the Contractor regarding construction documents authored by Architect's consultants will be through this party.
Vinci Hamp Architects, Inc.
1147 W Ohio Street
Suite 600
Chicago, IL 60642
(312) 733-7744
1. Contact:
Alex Krikhaar, AIA
akrikhaar@vinci-hamp.com

1.4 CONSULTANTS:
A. Mechanical Engineering Consultant - HVAC, Plumbing, Fire Protection & Electrical:
1. McGuire Engineers
300 S Riverside Plaza, #350
Chicago, IL 60606
(312) 876-9240
2. Contact:
David Brooks, President; dbrooks@mepcinc.com
Brian Anselm, Electrical Designer; banselm@mepcinc.com
B. Lighting Designer:
1. Schuler Shook
363 West Erie Street
Suite 400
Chicago, IL 60654
(312) 944-8230
2. Contact:
Emily Klingensmith
eklingensmith@schulershook.com
C. Acoustical & Audio/Visual Consultant:
1. Threshold Acoustics
141 West Jackson Blvd.
#2080
Chicago, IL 60604
(312) 386-1400

2. Contact - Acoustics:
   Marcus Mayell
   mmayell@threshold.llc
3. Contact - Audio/Visual:
   Marc Goossens
   mgoossens@threshold.llc

D. Graphics/Wayfinding Consultant:
1. Studio Kul
   805 Lake Street
   PMB 1021,
   Oak Park, IL 60301
   (773) 312-5854
2. Contact:
   Edward Kuleisis
   ek@studiokul.design

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THE PROJECT AND THE PARTIES:

1.1 PROJECT:

A. Lake Forest Library - Historic Rooms Revitalization
360 E. Deerpath Road
Lake Forest, Illinois 60045

1.2 OWNER:

A. Lake Forest Library
360 E. Deerpath Road
Lake Forest, Illinois 60045
Executive Director: Ms. Molly Scheibler, (847) 810-4602
mscheibler@lakeforestlibrary.org

1.3 ARCHITECT**:**

A. Vinci | Hamp Architects Inc.
1147 W. Ohio Street
Suite 600
Chicago, Illinois 60642
(312) 733-7744
B. Contact: Alex Krikhaar, AIA
akrikhaar@vinci-hamp.com

1.4 MANDATORY PRE-BID MEETING:

A. Tuesday , October 27, 2026, at 1:00 p.m., meet at the front entrance to the library.
1. BID DUE: Friday, November 20, 2026, at 5:00 p.m.
B. Submit Bids via e-mail to mscheibler@lakeforestlibrary.org with copy to akrikhaar@vinci-hamp.com. E-mail subject line: "Lake Forest Library Historic Rooms Revitalization – BID SUBMISSION"

1.5 SUMMARY OF THE WORK

A. Project includes renovation of seven historic spaces of various sizes, with work including new millwork, refinished wood paneling, restoration of marble flooring, reconstruction of historic marble circulation desk, restoration of bronze metalwork, new and restored lighting throughout, installation of acoustic ceiling finishes, carpeting, painting, signage, new and restored HVAC grilles, sprinkler modifications and electrical work.

1.6 COPIES OF BIDDING DOCUMENTS:

A. Bid documents are being provided in electronic format. Printed copies of Bidding Documents can be obtained from Architect/Engineer for $400.00 per set (drawings and project manual).

END OF SECTION

SUMMARY

1.1 THE INSTRUCTIONS IN THIS DOCUMENT AMEND OR SUPPLEMENT THE INSTRUCTIONS TO BIDDERS AND OTHER PROVISIONS OF THE BIDDING AND CONTRACT DOCUMENTS.

1.2 DOCUMENT INCLUDES

A. Definitions
B. Bidder's Representations
C. Bidding Documents
D. Historic Preservation Review
E. Bidding Procedures
F. Bidding Documents
G. Consideration of Bids
H. Post-Bid Information
I. Performance Bond & Payment Bond
J. List of Proposed Contract Documents

1.3 RELATED DOCUMENTS

A. Document 01 10 00 - Project Summary.
B. Document 00 41 00 - Bid Form.
C. Document 00 43 22 - Unit Prices Form.
D. Document 00 52 00 - Agreement Form and Rider
E. Document 00 60 00 - Bonds and Insurance Forms
F. Document 00 72 00 - General Conditions
G. Document 00 73 16 - Insurance and Bond Requirements

BID DOCUMENTS AND CONTRACT DOCUMENTS

2.1 DEFINITIONS

A. Bidding Documents: Bidding Documents include the Bidding Requirements and the Proposed Contract Documents. The Bidding Requirements consist of the advertisement or invitation to bid, instructions to Bidders, supplementary instructions to bidders, the bid form, and any other bidding forms. The proposed Contract Documents consist of the unexecuted form of Agreement between the Owner and Contractor and that Agreement's Exhibits, Rider to Agreement, Condition of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, all Addenda and Bond Requirements..
B. Definitions set forth in the General Conditions of the Contract for Construction, or in other Proposed Contract Documents apply to the Bidding Documents.
C. The terms *Architect*, *Engineer*, and *Architect/Engineer* are used interchangeably.
D. Addenda are written or graphic instruments issued by the Architect, which, by additions, deletions, clarifications, or corrections, modify or interpret the Bidding Documents.
E. A Bid is a complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.
F. The Base Bid is the sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents, to which Work may be added or deleted by sums stated in Alternate Bids.
G. An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from, or that does not change, the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.
H. A Unit Price is an amount stated in the Bid as a price per unit of measurement for materials, labor, equipment, or services, or a portion of the Work, as described in the Bidding Documents.

I. A Bidder is a person or entity who submits a Bid and who meets the requirements set forth in the Bidding Documents.
J. A Sub-bidder is a person or entity who submits a bid to a Bidder for materials, equipment, or labor for a portion of the Work.

2.2 BIDDER'S REPRESENTATIONS

A. By submitting a Bid, the Bidder represents that:
   1. The Bidder has read and understands the Bidding Documents;
   2. The Bidder understands how the Bidding Documents relate to other portions of the Project, if any, being bid concurrently or presently under construction;
   3. The Bid complies with the Bidding Documents;
   4. The Bidder has visited the site, become familiar with local conditions under which the Work is to be performed, and has correlated the Bidder's observations with the requirements of the Proposed Contract Documents;
      a. Bidder has attended mandatory pre-bid conference at the site on Tuesday, October 27, 2026 at 1pm Central Time.
      b. Bidder is responsible for verifying visible conditions, including dimensions, materials, and attachments to remain, on existing facility. Existing conditions shown on Drawings are for information only and must be verified in field.
      c. Schedule site visits by contacting Mr. Jim Lee, Facilities Manager, (847) 810-4624, jlee@lakeforestlibrary.org
   5. The Bid is based upon the materials, equipment, and systems required by the Bidding Documents without exception.

2.3 BIDDING DOCUMENTS

A. Distribution
   1. Bidders shall obtain complete Bidding Documents from the issuing office designated in the advertisement or invitation to bid.
   2. Electronic versions of Bidding Documents shall be provided at no cost to Bidders. Paper copies are available for a fee upon request.
   3. Bidding Documents will not be issued directly to Sub-bidders unless specifically offered in the advertisement or invitation to bid, or in supplementary instructions to bidders.
   4. Bidders shall use complete Bidding Documents in preparing Bids. Neither the Owner nor Architect assumes responsibility for errors or misinterpretations resulting from the use of incomplete Bidding Documents.
   5. The Bidding Documents will be available for the sole purpose of obtaining Bids on the Work. No license or grant of use is conferred by distribution of the Bidding Documents.
B. Modification or Interpretation of Bidding Documents
   1. The Bidder shall carefully study the Bidding Documents, shall examine the site and local conditions, and shall notify the Architect of errors, inconsistencies, or ambiguities discovered and request clarification or interpretation pursuant to paragraph B.2, below.
   2. Requests for clarification or interpretation of the Bidding Documents shall be submitted by the Bidder via e-mail and shall be received by the Architect at least seven days prior to the date for receipt of Bids.
   3. Modifications and interpretations of the Bidding Documents shall be made by Addendum. Modifications and interpretations of the Bidding Documents made in any other manner shall not be binding, and Bidders shall not rely upon them.
C. Substitutions
   1. The materials, products, and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance, and quality to be met by any proposed substitution.
   2. Substitution Process:

a. Written requests for substitutions shall be received by the Architect at least ten days prior to the date for receipt of Bids. Requests shall be submitted in the same manner as that established for submitting clarifications and interpretations in paragraph B.2, above.
b. Requests shall include (1) the name of the material or equipment specified in the Bidding Documents; (2) the reason for the requested substitution; (3) a complete description of the proposed substitution including the name of the material or equipment proposed as the substitute, performance and test data, and relevant drawings; and (4) any other information necessary for an evaluation. The request shall include a statement setting forth changes in other materials, equipment, or other portions of the Work, including changes in the work of other contracts or the impact on any Project Certifications, that will result from incorporation of the proposed substitution.

3. The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.
4. If the Architect approves a proposed substitution prior to receipt of Bids, such approval shall be set forth in an Addendum. Approvals made in any other manner shall not be binding, and Bidders shall not rely upon them.
5. No substitutions will be considered after the Contract award unless specifically provided for in the Contract Documents.

D. Addenda
1. Addenda will be transmitted to Bidders known by the issuing office to have received complete Bidding Documents.
2. Addenda will be transmitted to Bidders via email.

E. Addenda will be available where Bidding Documents are on file.
F. Addenda will be issued no later than four days prior to the date for receipt of Bids, except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.
G. Prior to submitting a Bid, each Bidder shall ascertain that the Bidder has received all Addenda issued, and the Bidder shall acknowledge their receipt in the Bid.

2.4 HISTORIC PRESERVATION REVIEW

A. The Lake Forest Library is located within the National Register-listed Lake Forest Historic District. The building's exterior is subject to review by the City of Lake Forest Historic Preservation Commission (HPC). Work in this project that is subject to HPC's exterior review includes only the building's exterior front door. The project's interior spaces are not subject to HPC review. The Owner will schedule a meeting to present this exterior feature of the project to the HPC at a public meeting on Wednesday October 28, 2026. If necessary, based upon comments provided by the HPC, the architect will issue an Addendum to all plan holders prior to the bid due date.

2.5 BIDDING PROCEDURES

A. Preparation of Bids
1. Bids shall be submitted on the forms included with or identified in the Bidding Documents.
2. All blanks on the bid form shall be legibly executed. Paper bid forms shall be executed in a non-erasable medium.
3. Sums shall be expressed in both words and numbers, unless noted otherwise on the bid form. In case of discrepancy, the amount entered in words shall govern.
4. Edits to entries made on paper bid forms must be initialed by the signer of the Bid.
5. All requested Alternates, if any, shall be bid. If no change in the Base Bid is required, enter "No Change" or as required by the bid form.
6. Where two or more Bids for designated portions of the Work have been requested, the Bidder may, without forfeiture of the bid security, state the Bidder's refusal to accept

award of less than the combination of Bids stipulated by the Bidder. The Bidder shall neither make additional stipulations on the bid form nor qualify the Bid in any other manner.

7. Each copy of the Bid shall state the legal name and legal status of the Bidder. As part of the documentation submitted with the Bid, the Bidder shall provide evidence of its legal authority to perform the Work in the jurisdiction where the Project is located. Each copy of the Bid shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further name the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached, certifying the agent's authority to bind the Bidder.
8. A Bidder shall incur all costs associated with the preparation of its Bid.
9. **Contractor's Qualification Statement**. Bidders shall include properly executed AIA Document A305-2020, the Contractor's Qualification Statement with their Bid. Document A305 must include completed Exhibits A, B and D.
    a. Modify Document A305 - Exhibit A, A.2.1 to read: " Complete Exhibit D to describe up to four projects, either completed or in progress, of similar scope, scale and technical complexity to this Project. Note if such projects are listed on either national, state or local historic registries.
    b. Similar qualifications material shall be provided for principal Subcontractors performing more than 15 percent of the contracted work.

B. Bid Security
1. Each Bidder shall provide Bid security in the amount of five (5) percent of Base Bid Total amount, in form of surety bond or cashier's check.
2. The Bidder pledges to enter into a Contract with the Owner on the terms stated in the Bid and shall, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds if required, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty.
3. If a surety bond is required as bid security, it shall be written on AIA Document A310, Bid Bond, unless otherwise provided in the Bidding Documents. The attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of an acceptable power of attorney. The Bidder shall provide surety bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.
4. The Owner will have the right to retain the bid security of Bidders to whom an award is being considered until (a) the Contract has been executed and bonds, if required, have been furnished; (b) the specified time has elapsed so that Bids may be withdrawn; or (c) all Bids have been rejected. However, if no Contract has been awarded or a Bidder has not been notified of the acceptance of its Bid, a Bidder may, beginning 60 calendar days after the opening of Bids, withdraw its Bid and request the return of its bid security.

C. Schedule
1. With Bid, a Bidder shall provide a draft construction schedule, including project phasing, indicating duration of major divisions of work, proposed date for mobilization on site, and proposed date of Substantial Completion.

D. Submission of Bids
1. A Bidder shall submit its Bid via e-mail to Molly Scheibler, Executive Director, at mscheibler@lakeforestlibrary.org with copy to the Architect, Alex Krikhaar at akrikhaar@vinc-hamp.com
2. The subject line of the e-mail shall state: "Lake Forest Library Historic Rooms Revitalization – BID SUBMISSION"

3. Bids shall be submitted by the date and time and at the place indicated in the invitation to bid. Bids submitted after the date and time for receipt of Bids, or at an incorrect place, will not be accepted.
4. The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids.
5. The Owner reserves the right to reject a Bid submitted by any method other than as provided in this section.
6. Paper copies of the Bid, the bid security, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope, delivered to the library to the attention of Ms. Molly Scheibler, Executive Director. The envelope shall be identified with the Project name and the Bidder's name and address. The outermost sealed envelope shall be marked with the notation "SEALED BID ENCLOSED" on its face. The paper copies shall be received within three days after the bid date and time indicated in the invitation to bid.

E. Modification or Withdrawal of Bid
1. Prior to the date and time designated for receipt of Bids, a Bidder may submit a new Bid to replace a Bid previously submitted, or withdraw its Bid entirely, by notice to the party designated to receive the Bids. Such notice shall be received and duly recorded by the receiving party on or before the date and time set for receipt of Bids. The receiving party shall verify that replaced or withdrawn Bids are removed from the other submitted Bids and not considered. Notice of submission of a replacement Bid or withdrawal of a Bid shall be worded so as not to reveal the amount of the original Bid.
2. Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids in the same format as that established in paragraph 2.5-D, above, provided they fully conform with these Instructions to Bidders. Bid security shall be in an amount sufficient for the Bid as resubmitted.
3. After the date and time designated for receipt of Bids, a Bidder who discovers that it made a clerical error in its Bid shall notify the Architect of such error within two days, or pursuant to a timeframe specified by the law of the jurisdiction where the Project is located, requesting withdrawal of its Bid. Upon providing evidence of such error to the reasonable satisfaction of the Architect, the Bid shall be withdrawn and not resubmitted. If a Bid is withdrawn pursuant to this section, the bid security shall be returned to the Bidder.

2.6 CONSIDERATION OF BIDS

A. Opening of Bids
1. Bids shall be opened in private. A summary of the Bids may be made available to Bidders at the sole discretion of the Owner.

B. Rejection of Bids
1. The Owner shall have the right to accept or reject any or all Bids.

C. Acceptance of Bid (Award)
1. It is the intent of the Owner to award a Contract to the lowest quallified responsive and responsible Bidder, provided the Bid has been submitted in accordance with the requirements of the Bidding Documents. Unless otherwise prohibited by law, the Owner shall have the right to waive informalities and irregularities in a Bid received and to accept the Bid which, in the Owner's judgment, is in the Owner's best interests.
   a. Duration of construction period is of the essence to Owner and will be considered in awarding a Contract.
2. Unless otherwise prohibited by law, the Owner shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Bidding Documents, and to determine the lowest responsive and responsible Bidder on the basis of the sum of the Base Bid and Alternates accepted.
3. Bidder shall execute Owner-Contractor Agreement within thirty (30) calendar days of receipt of notice of bid acceptance.

2.7 POST-BID INFORMATION

A. Submittals

1. After notification of selection for the award of the Contract, the Bidder shall, as soon as practicable or as stipulated in the Bidding Documents, submit in writing to the Owner through the Architect:
   a. A designation of the Work to be performed with the Bidder's own forces;
   b. Names of the principal products and systems proposed for the Work and the manufacturers and suppliers of each; and
   c. Names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work.
2. The Bidder will be required to establish to the satisfaction of the Architect and Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents.
3. Prior to the execution of the Contract, the Architect will notify the Bidder if either the Owner or Architect, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the Owner or Architect has reasonable objection to a proposed person or entity, the Bidder may, at the Bidder’s option, withdraw the Bid or submit an acceptable substitute person or entity. The Bidder may also submit any required adjustment in the Base Bid or Alternate Bid to account for the difference in cost occasioned by such substitution. The Owner may accept the adjusted bid price or disqualify the Bidder. In the event of either withdrawal or disqualification, bid security will not be forfeited.
4. Persons and entities proposed by the Bidder and to whom the Owner and Architect have made no reasonable objection must be used on the Work for which they were proposed and shall not be changed except with the written consent of the Owner and Architect.

2.8 PERFORMANCE BOND AND PAYMENT BOND

A. Bond Requirements

1. If stipulated in the Bidding Documents, the Bidder shall furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder.
2. If the furnishing of such bonds is stipulated in the Bidding Documents, the cost shall be included in the Bid. If the furnishing of such bonds is required after receipt of bids and before execution of the Contract, the cost of such bonds shall be added to the Bid in determining the Contract Sum.
3. The Bidder shall provide surety bonds from a company that is acceptable to the Owner.
4. Provide performance and payment bonds for 100 percent of Contract Amount.

B. Time of Delivery and Form of Bonds

1. The Bidder shall deliver the required bonds to the Owner not later than three days following the date of execution of the Contract. If the Work is to commence sooner in response to a letter of intent, the Bidder shall, prior to commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished and delivered in accordance with this Section.
2. Unless otherwise provided, the bonds shall be written on AIA Document A312, Performance Bond and Payment Bond.
3. The bonds shall be dated on or after the date of the Contract.
4. The Bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix to the bond a certified and current copy of the power of attorney.

2.9 LIST OF THE PROPOSED CONTRACT DOCUMENTS

A. The proposed Contract Documents have been made available to the Bidder and consist of the following documents:

1. Proposed Agreement and conditions as enumerated in Sections 00 52 00 Agreement Form, 00 72 00 General Conditions, and 00 73 16 Insurance and Bond Requirements.
2. Rider to AIA A101.
3. Drawings as enumerated in Section 00 01 15 List of Drawing Sheets.
4. Specifications as enumerated in Section 00 01 10 Table of Contents.
5. Addenda issued prior to the Bid due date.

END OF SECTION

THE PROJECT AND THE PARTIES

1.1 PROJECT

A. Lake Forest Library; Historic Rooms Revitalization
360 E Deerpath Rd
Lake Forest, Illinois 60045

1.2 BIDS DUE

A. Friday, November 20, 2026, at 5:00pm

1.3 SUBMITTED TO

LAKE FOREST LIBRARY
360 E Deerpath Rd.
Lake Forest, Illinois 60045
Executive Director: Mrs. Molly Scheibler; (847) 810-4602
msheibler@lakeforestlibrary.org
Email subject line: "Lake Forest Library Historic Rooms Revitalization - BID SUBMISSION"

1.4 COPY TO

Vinci | Hamp Architects, Inc. (VHA)
1147 W. Ohio St., Suite 600
Chicago, IL 60642
Project Manager: Mr. Alex Krikhaar, AIA, (312) 733-7744
akrikhaar@vinci-hamp.com

1.5 SUBMITTED BY

_____
Bidder Name

_____
Bidder Address

_____
Bidder Point of Contact

1.6 CERTIFICATIONS AND ACKNOWLEDGEMENT OF ADDENDA

A. Bidder certifies that
1. Bidder has carefully read and understands Bidding Documents;
2. Bidder has visited site and become familiar with local conditions under which Work is to be performed, including verifying visible conditions, such as dimensions, materials, and attachments to remain on existing facility; and
3. Bidder has correlated Bidder's personal observations with requirements of Bidding Documents. Bidding Documents include Project Manual and Drawings prepared by Vinci | Hamp Architects and dated October 20, 2026, and addenda.

B. Bidder may not withdraw Bid within 60 calendar days after Bid Due date.

C. Bidder agrees that Owner has right to waive informalities and irregularities in Bid received and to accept Bid which, in Owner's judgment, is in Owner's best interests.

D. Bidder shall notify Architect of discrepancies, omissions, conflicts, or unclear meaning within Contract Documents; Architect will interpret Contract Documents and, if necessary, issue written addendum. Contracted Work will be based on Architect's interpretation of Contract Documents.

E. Bidder acknowledges receipt of following addenda:

No._____ Dated_____

No._____ Dated_____

No._____ Dated_____

1.7 BASE BID

A.

Scope Item	Subtotal
1. General conditions, permits, site protection, selective demolition, interior work, and all work not otherwise included in the items below	$_____
2. Performance and payment bonds	$_____
3. Demolition	$_____
4. Metal Conservation and Repairs	$_____
5. Metal Fabrications	$_____
6. Architectural Wood Restoration	$_____
7. Rough Carpentry	$_____
8. Architectural Wood Casework	$_____
9. Firestopping	$_____
10. Sealants	$_____
11. Bronze Doors	$_____
12. Plaster Repairs	$_____
13. Seamless Acoustic System	$_____
14. Stone Floor Restoration	$_____
15. Carpeting	$_____
16. Painting	$_____
17. Signage	$_____
18. Fireplace Repairs	$_____
19. Fire Sprinkler Modifications	$_____
20. HVAC	$_____
21. Electrical	$_____
22. Lighting Controls	$_____
23. Refurbished Light Fixtures	$_____
24. Fire Detection and Alarm Modifications	$_____
Total Base Bid Furnish labor, materials, services, and equipment necessary for completion of Work, except for Work listed as alternatives, for lump sum of $_____. In words:_____DOLLARS.	

1.8 BASE BID CONSTRUCTION PERIOD

A. Start work within _____ calendar days after notice of Contract award and complete Base Bid Work within _____ calendar days after start date.

1.9 MARKUPS

A. In the event of Change Order or other mutually agreed modification to the contract sum, a markup of _____ percent for Overhead & Profit will be applied to the cost of the trades, and a markup of _____ percent for Insurance & Bonds will be applied to the cost of the trades.

1.10 SUBCONTRACTORS

A. Bid is predicated on acceptance by Owner and Architect of following principal contractors:

_____
Subcontractor Name, Address, and Scope of Work

_____
Subcontractor Name, Address, and Scope of Work

_____
Subcontractor Name, Address, and Scope of Work

_____
Subcontractor Name, Address, and Scope of Work

1.11 BID SECURITY

A. Provided as paper copy under separate cover is bid security, in the form of surety bond or cashier's check, in amount of 5 percent of Base Bid security will be forfeited to Owner as liquidated damages in the event that Bidder fails to execute and to furnish required bonds and insurance certificates to Owner within three days thereafter.

1.12 SIGNATURE

Submitted By:

_____
Signature

_____
Title

_____
Company Seal (if Bidder is a corporation)

END OF SECTION

PART 1 GENERAL

1.1 AGREEMENT FORM

A. Owner/Contractor Agreement form is AIA Document A101-2017. Standard Form of Agreement Between Owner and Contractor. Free sample previews of the document are availible at www.aiacontracts.org.

B. The attached Rider to AIA Document A101-2017 shall be signed and shall accompany the Standard Form of Agreement Between Owner and Contractor. The Rider will be enumerated as part of Article 9 of the AIA A101 form.

C. Terms *Architect, Engineer, and Architects/Engineer* are used interchangeably.

1.2 RELATED REQUIREMENTS

A. Section 00 72 00 - General Conditions

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

For Inclusion in Standard Form of Agreement
Between Owner and Contractor ("Agreement")
(AIA Document A101-2017) dated _____, 2026
Between the
Lake Forest Public Library ("Owner")
_____ ("Contractor")

For Information Purposes:

The Project relates to "Revitalization of the Lake Forest Public Library's 1931 Historic Rooms"

The Architect on this project is Vinci-Hamp Architects, Inc.

A. This Rider to applies to all services to be provided by Contractor pursuant to the Agreement.

B. The bid specifications and Contractor's bid are hereby incorporated into the Agreement by way of this provision.

C. All representations made by the Owner in the Contract Documents that complete the Agreement are made to the best of Owner's knowledge and belief.

D. Contractor shall provide a Payment Bond and a Performance Bond in a sum equal to 100% of the amount of the contract issued by an insurance company acceptable to Owner. All bonds required under this Agreement shall be issued by a surety company: (a) duly authorized and licensed to do business in the State of Illinois; (b) listed in the current United States Department of the Treasury Circular 570; and (c) having a current A.M. Best rating of not less than A- (Excellent). Owner reserves the right to reject any bond issued by a surety that does not meet these requirements.

E. All Performance and Payment Bonds required shall be on AIA Document A312-2010 Performance Bond and Payment Bond (or the most current equivalent form) or on a form otherwise approved in writing by Owner in Owner's sole discretion. Performance Bonds to be provided (AIA Form) shall contain the following language:

> "Any suit under this bond must be instituted before the expiration of the statute of limitation applicable to any claims against the Contractor named herein, and further, the parties intend that modifications in the Agreement or Contract Documents or Performance Bond of the limitations provided by 735 ILCS 5/13-214, if any, shall be given no effect."

F. Any claims shall be commenced within the limitations stated in 735 ILCS 5/13-214*. The parties intend that modifications in the Agreement or Contract Documents of the limitations provided by 735 ILCS 5/13-214, if any, shall be given no effect. Nothing in this Agreement, including any warranty or correction-of-work provisions, shall be construed to shorten, waive, or otherwise limit Owner's right to bring claims within the periods established by 735 ILCS 5/13-214. Any correction period set forth in AIA Document A201-2017 or elsewhere in the Contract Documents is in addition to, and not in lieu of, Owner's statutory rights under 735 ILCS 5/13-214.

G. Contractor shall purchase insurance to cover claims and expenses, including costs of defense, asserted against Owner and Architect, their agents, employees and consultants for bodily injury, sickness, disease or death caused by any negligent act or omission of the Contractor, anyone directly or indirectly employed by them or anyone for whose acts any of them may be liable. The coverage afforded the Owner and Architect shall be primary insurance for the Owner and Architect with respect to claims arising out of operations performed by or on behalf of the Contractor. If the Owner and Architect have other insurance which is applicable to the loss, such other insurance shall be on an excess or contingent basis. The amount of liability of the Contractor under this insurance policy shall not be reduced by the existence of such other insurance.

1. Such insurance shall be written to include the following coverages and for not less than the following minimum limits, or greater if required by law:

i. General Liability:
   1. Commercial General Liability
   2. Occurrence Basis
   3. Limits:
      a. General Aggregate - $4,000,000
      b. Products – Comp / Ops Aggregate - $2,000,000
      c. Personal & Advertising Injury - $1,000,000
      d. Each Occurrence - $2,000,000
      e. Fire Damage (any one fire) - $50,000
      f. Medical Expense (any one person) - $5,000

ii. Automobile Liability
   1. Any Auto Owned by Contractor
   2. Hired Autos
   3. Non-Owned Autos
   4. Limits:
      a. Combined Single Limit - $2,000,000

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* (a) Actions based upon tort, contract or otherwise against any person for an act or omission of such person in the design, planning, supervision, observation or management of construction, or construction of an improvement to real property shall be commenced within 4 years from the time the person bringing an action, or his or her privity, knew or should reasonably have known of such act or omission. Notwithstanding any other provision of law, contract actions against a surety on a payment or performance bond shall be commenced, if at all, within the same time limitation applicable to the bond principal.

(b) No action based upon tort, contract or otherwise may be brought against any person for an act or omission of such person in the design, planning, supervision, observation or management of construction, or construction of an improvement to real property after 10 years have elapsed from the time of such act or omission . . .

iii. Umbrella / Excess Liability
  1. Limits:
    a. Each Occurrence - $5,000,000 over primary insurance
    b. Aggregate - $5,000,000 over primary insurance

iv. Workers' Compensation and Employers' Liability
  1. State: Statutory
  2. Employers' Liability Limits:
    a. Each Accident - $1,000,000
    b. Disease-Policy Limit - $1,000,000
    c. Disease-Each Employee - $1,000,000

The General Liability policy shall include an endorsement identifying Owner, Architect Additional Insureds for all work performed at any location on ISO Forms CG2010 07/04 and CG2037 07/04 or their equivalent. The coverage afforded all the Additional Insureds under the policy shall be endorsed as Primary and Non-Contributory with respect to any insurance maintained by or available to the Additional Insureds, including waiver of rights of subrogation for all work performed in all locations.

All endorsements, including but not limited to, Additional Insured and Waiver of Subrogation Rights endorsements, will be submitted with current Certificate of Insurance.

The Umbrella/Excess Liability is to be follow form, including Additional Insureds under the Contractor's policy shall be endorsed as Primary and Non-Contributory with respect to any insurance maintained by or available to the Additional Insureds, including waiver of rights of subrogation for all work performed in all locations.

Each required policy shall provide that it will not be cancelled, non-renewed, or materially reduced in coverage or limits without at least thirty (30) days' advance written notice to Owner and Architect (ten (10) days' notice in the case of cancellation for nonpayment of premium). The certificate of insurance shall name the Owner, the Board of Library Trustees of the Lake Forest Public Library, and their officers, employees, and volunteers, and the Architect, as certificate holders. If any part of the Work involves the disturbance of existing building materials that may contain asbestos or other regulated materials, or involves a design-assist or delegated-design component for the elevator system, Contractor shall additionally maintain (a) contractor's pollution liability coverage in an amount not less than $1,000,000 per occurrence, and (b) professional liability coverage applicable to any delegated design services, in an amount not less than $1,000,000 per claim, each of which shall be maintained for the duration of the Work and, where written on a claims-made basis, for not less than two (2) years following Substantial Completion.

H. Waiver of Workers' Compensation Contribution Cap.

1. Waiver by Contractor. To the fullest extent permitted by law, the Contractor, on behalf of itself and all of its subcontractors, sub-subcontractors, and any other person or entity performing Work or services in connection with the Project (collectively, "Contractor Parties"), expressly and unconditionally waives any and all rights, protections, and limitations on contribution liability arising under or by virtue of Section 5(a) of the Illinois Workers' Compensation Act, 820 ILCS 305/5(a), as interpreted by *Kotecki v. Cyclops Welding Corp.*, 146 Ill. 2d 155 (1991), and its progeny, including but not limited to *Braye v. Archer-Daniels-Midland Co.*, 175 Ill. 2d 201 (1997), and any successor or related decisions of the Illinois courts. This waiver applies to any claim for contribution or indemnification asserted by or on behalf of the Owner, the Architect, or any other party against any

Contractor Party arising out of or related to bodily injury, death, or property damage sustained by any employee of any Contractor Party in connection with the performance of the Work.

2. Scope of Waiver. By executing this Agreement, the Contractor agrees that, in the event any Contractor Party is found liable to contribute to or indemnify the Owner or Architect for any judgment, settlement, damages, costs, or expenses arising from a claim brought by an employee of any Contractor Party, the Contractor Party's contribution or indemnification liability shall not be limited to the amount of workers' compensation benefits paid or payable to such employee under the Illinois Workers' Compensation Act, but shall instead extend to the Contractor Party's full proportionate share of liability as determined by a court of competent jurisdiction or as otherwise agreed in settlement.

3. The Contractor shall include a provision in every subcontract, purchase order, and other agreement with any person or entity performing any portion of the Work, requiring such subcontractor, sub-subcontractor, supplier, or other person or entity to waive its rights under 820 ILCS 305/5(a) to the same extent and on the same terms as set forth in this Section H.3 of this Rider. The Contractor shall obtain written confirmation of such waiver from each subcontractor and sub-subcontractor prior to commencement of the Work by such party, and shall provide copies of such confirmations to the Owner upon request. The Contractor's failure to obtain and flow down this waiver shall not relieve any Contractor Party of the obligation to waive its Kotecki rights, and the Owner shall be deemed a third-party beneficiary of each such subcontract provision.

4. Voluntary and Knowing Waiver. The Contractor acknowledges that it has had the opportunity to consult with legal counsel of its choice regarding the nature and effect of this waiver, that it understands the rights being waived, including the limitation on contribution liability established by Section 5(a) of the Illinois Workers' Compensation Act as interpreted by *Kotecki v. Cyclops Welding Corp.* and its progeny, and that it executes this waiver voluntarily and knowingly as a material condition of this Agreement and the Owner's award of the Contract.

5. Survival. The waiver set forth in this Section H.5 of this Rider shall survive the completion, termination, or expiration of this Agreement and shall remain in full force and effect with respect to any claim arising from events occurring during the performance of the Work, regardless of when such claim is asserted.

6. Consistency with Indemnification. This Section H is intended to complement and be read consistently with the indemnification provisions set forth in this Rider, as incorporated herein. In the event of any conflict between this Section H of this Rider and any provision of the Contract Documents, this Section H shall control to the extent it provides broader protection to the Owner.

I. Prior to commencement of the Work, Contractor shall provide the Owner with a written list of all subcontractors and material suppliers to be engaged on the Project, including their names, addresses, and scope of work. Contractor shall promptly notify the Owner in writing of any change in the subcontractor list. Contractor shall include in every subcontract a provision requiring the subcontractor to: (a) comply with all applicable laws and regulations, including the Illinois Prevailing Wage Act; (b) maintain insurance meeting the requirements of this Agreement; (c) waive Kotecki rights as required by this Rider; (d) provide lien waivers upon each payment; and (e) cooperate with the Owner's FOIA obligations. Contractor shall provide the Owner with copies of all subcontracts upon request. The Owner's knowledge of or consent to any subcontract shall not relieve the Contractor of any of its obligations under the Contract Documents.

J. Work will not begin, nor will any payment be authorized absent submission by the Contractor to the Owner of proof that all required insurance coverages and bonds are in effect. A Certificate of Insurance is not adequate proof. The Contractor may provide a Certificate of Insurance but shall also provide the actual endorsement from the contractor's insurance company.

K. "As built" drawings from the Contractor are a condition of receipt of the Contractor's final payment.

L. The responsibilities/liabilities of the Owner and the Contractor and their consultants, agents and employees and any concomitant damages and/or consequential damages shall be determined in such amount and to such extent as provided by Illinois law, insurance coverage, caps or limitations notwithstanding. By way of this provision, the parties intend that any limitations in the Agreement of the amounts or types of damages available to the parties shall be given no effect. AIA Document A201-2017 § 15.1.7 (Waiver of Claims for Consequential Damages) is deleted in its entirety and replaced with the following: The Contractor waives all Claims against the Owner for consequential damages arising out of or relating to this Contract. The Owner does not waive, and expressly reserves, all Claims against the Contractor for damages described in Rider Paragraph CC (Time is of the Essence; Delay Damages), including without limitation extended Architect fees, costs of temporary facilities or alternate accommodations for library operations, and additional inspection and testing costs, each of which the parties agree constitutes direct damages recoverable by the Owner and not consequential damages within the meaning of any provision of the Contract Documents.

M. The Contractor shall reimburse the Owner for all reasonable fees charged to the Owner by the Architect, if any, which the Owner incurs as a result of the Contractor's failure to fulfill the Contractor's obligations including, without limitation, timely completion of the project.

N. Contractor shall pay all reasonable attorneys' fees, experts' fees, and costs incurred by the Owner in enforcing the terms and provisions of this Agreement and in defending any proceeding to which the Owner is made a party as result of the acts or omissions of the Contractor.

O. Contractor shall defend, indemnify, and hold harmless Owner and Architect from and against all claims, losses, damages, and expenses to the extent such claims, losses, damages or expenses are caused by Contractor's conduct, acts, errors or omissions, and to the fullest extent permitted by law, Contractor's obligation to defend shall require Contractor to retain counsel acceptable to Owner and to pay all costs of such defense from the date of tender. This provision shall not require Contractor to indemnify Owner or Architect for claims arising solely from Owner's or Architect's own negligence, as prohibited by 740 ILCS 35/1.

P. AIA Document A201-2017 § 9.10.4 is amended to add the following additional exceptions to the Owner's waiver of Claims upon final payment: (5) Claims for delay damages under Rider Paragraph CC (Time is of the Essence; Delay Damages); (6) Claims for indemnification under this Paragraph P; (7) Claims for reimbursement of Architect's fees under Rider Paragraph N; and (8) any Claim identified in writing by the Owner as unresolved prior to or concurrently with final payment.

Q. In an effort to resolve any conflicts that arise under this Agreement, prior to commencing litigation all disputes between the Owner and the Contractor arising out of or relating to this Agreement shall be submitted to non-binding mediation. After such non-binding mediation and, unless the parties agree to submit to binding arbitration, any claims, disputes, liabilities of the parties or other matters between the Owner and the Contractors shall be resolved in the Circuit Court of Cook County, Illinois in accordance with Illinois law.

R. Section 7.1 of AIA Document A101-2017, as completed for this Agreement, supersedes and replaces Article 14.4 of AIA Document A201-2017 (Termination by the Owner for Convenience) in its entirety. In the event the Owner terminates this Agreement, or elects not to proceed with the Project or any subsequent phase thereof, for its convenience, Section 7.1 of AIA Document A101-2017 is the sole and exclusive measure of the Contractor's recovery, and Article 14.4 of AIA Document A201-2017 shall be given no effect.

S. Contractor acknowledges that, because the Project site is public property of the Owner, an Illinois political subdivision, no mechanics' lien attaches to the Project under Illinois law, and that the exclusive remedy of unpaid Subcontractors and material suppliers is a claim against the Payment Bond required under the Public Construction Bond Act, 30 ILCS 550/1 et seq. Notwithstanding the foregoing, Contractor shall obtain lien waivers for all labor and materials for the project. As a condition of each progress payment, Contractor shall deliver to Owner: (a) a sworn contractor's statement listing all Subcontractors, material suppliers, and others who have furnished labor, materials, or services in connection with the Work through the period covered by the payment application, together with the amounts owed to each; and (b) executed lien waivers, conditioned or unconditional as appropriate, from Contractor and from all Subcontractors and material suppliers who performed work or furnished materials through the period of the prior payment application, on forms approved by Owner. Final payment shall not be made until Contractor delivers unconditional final lien waivers from Contractor and all Subcontractors and material suppliers.

T. Contractor acknowledges sole responsibility for determining the nature and extent of any and all work required to complete the Project.

U. It is intended that neither the Owner nor the Architect has responsibility for constructions means, methods, techniques, sequences, or procedures, and/or safety precautions and programs.

V. Contractor shall at all times observe and comply with all laws, ordinances, regulations and codes of any applicable governmental entity including, without limitation, prevailing wage laws. Without limiting the foregoing, Contractor and all Subcontractors shall comply with the Illinois Prevailing Wage Act, 820 ILCS 130/0.01 et seq. Contractor shall: (a) obtain and post the current Lake County prevailing wage determination at the Project site throughout the duration of the Work; (b) submit certified payroll records to Owner on a monthly basis in the form required by the Illinois Department of Labor; and (c) include prevailing wage compliance obligations and certified payroll submission requirements in each subcontract. Contractor shall indemnify, defend, and hold Owner harmless from any claims, penalties, back wages, or liabilities arising from Contractor's or any Subcontractor's failure to comply with the Illinois Prevailing Wage Act.

W. Contractor acknowledges full and sole authority for all safety programs and precautions in connection with the work.

X. Contractor acknowledges that they have examined the property and have familiarized themselves with all local conditions affecting the property.

Y. The Contractor's standard of care shall be the standard of care consistent with those usual and customary standards of professional care, skill, and diligence which are, at the time of performance of services under this Agreement, commonly followed by Contractors performing the same or similar services in the locale in which the Project is located. Consistent with this standard of care, Contractor is cognizant of its duties:

a) vis-à-vis assessing compliance with the Drawings and Specs; and

b) to confirm in writing, when appropriate, interpretations by government officials of building codes and applicable regulations.

Z. Contractor, at Contractor's expense, will obtain and maintain all necessary permits and licenses.

AA. Contractor shall provide Owner with all documents requested by Owner thereby enabling Owner to respond timely to any request to Owner for documents pursuant to the Freedom of Information Act. Upon receipt of written request from Owner, Contractor shall produce any requested Project records to Owner within three (3) business days, or such shorter period as Owner may specify in its sole discretion when necessary to comply with the timelines imposed by the Illinois Freedom of Information Act, 5 ILCS 140/1 et seq. Contractor's failure to timely produce records shall constitute a material breach of this Agreement, and Contractor shall indemnify Owner for any penalties, attorneys' fees, or costs imposed on Owner as a result of such failure, including any civil penalties assessed under 5 ILCS 140/11. Contractor shall retain all Project records, including but not limited to correspondence, submittals, shop drawings, daily reports, subcontractor agreements, certified payrolls, payment records, and as-built drawings, for a minimum of ten (10) years following Substantial Completion of the Work, and shall make such records available to Owner upon request within the timeframes required by this Agreement.

BB. The Owner is subject to the Freedom of Information Act, 5 ILCS 140/1, et seq. ("FOIA"). All information submitted by Contractor to Owner is subject to disclosure to third parties in accordance with FOIA. If Contractor intends for Owner to withhold the bidder's trade secrets, commercial information, or financial information from disclosure to a third party in response to a FOIA request, Contractor must include with its bid written notification specifically identifying such information, along with a statement that disclosure of such information will cause competitive harm to the bidder, as provided by FOIA Section 7(1)(g), 5 ILCS 140/7(1)(g). Any information submitted which is not so marked by Contractor at the time of bid submittal will be presumed to be open to public inspection. Contractor may be required to substantiate the basis for its claims. Owner reserves the right, in its sole discretion and subject only to applicable law, to withhold or release Contractor's information in response to a FOIA request.

CC. Notice via email to the Contractor's Representative and the Owner's Representative identified in the Agreement shall constitute valid written notice.

DD. Time is of the Essence; Delay Damages. Time is of the essence with respect to the Substantial Completion date set forth in Section 3.3.1 of the Agreement. In the event Contractor fails to achieve Substantial Completion by _____, Contractor shall reimburse Owner for all actual, documented damages incurred by Owner as a result of such delay, including without limitation: (a) extended construction administration fees of the Architect; (b) costs of temporary facilities or alternate accommodations for library operations; (c) additional inspection and testing costs; and (d) other direct costs attributable to the delay. Owner's right to recover actual delay damages shall not be limited by the absence of a liquidated damages provision in the Agreement. Contractor shall not be entitled to any delay damages or additional compensation for delays caused by Owner unless Owner has issued a written Change Order expressly authorizing such additional compensation.

EE. Change Orders. No change in the Work shall be effective unless authorized by a written Change Order signed by Owner's representative and, where required by law, approved by the Library Board of Trustees. No oral authorization or course of conduct shall constitute authorization for additional work or additional compensation. Contractor shall promptly notify Owner in writing of any condition it believes entitles it to a change in the Contract Sum or Contract Time; any claim not raised in writing within seven (7) days of the occurrence giving rise to the claim shall be deemed waived. Owner reserves the right to reject any proposed change order that would, in combination with prior change orders, result in a material change in the scope of Work that should, in Owner's legal counsel's judgment, be re-bid under applicable law. This seven (7) day notice period supersedes and replaces, solely with respect to Claims for a change in the Contract Sum or Contract Time, the notice period set forth in Section 15.1.3 of AIA Document A201-2017. The notice period set forth in Section 15.1.3

of AIA Document A201-2017 remains unaffected and continues to apply to all other Claims.

FF. Substantial Completion Defined. For purposes of this Agreement, Substantial Completion shall mean the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that Owner can occupy and utilize the renovated spaces for their intended purpose as a public library open to the public, including receipt of all required certificates of occupancy and all required approvals from applicable governmental authorities.

GG. Equal Employment Opportunity. Contractor shall comply with all applicable equal employment opportunity laws, including the Illinois Human Rights Act, 775 ILCS 5/, and any applicable federal requirements. Contractor shall not discriminate against any employee or applicant on the basis of race, color, religion, sex, national origin, ancestry, age, disability, or any other characteristic protected by applicable law. Contractor shall include equivalent equal employment opportunity obligations in each subcontract.

HH. THIS RIDER IS THE LAST ARTICLE TO THE AGREEMENT AND IS EXECUTED ON THE DATES STATED BELOW. IN THE EVENT OF ANY CONFLICT BETWEEN THE PROVISIONS OF THIS RIDER AND ANY OTHER PROVISION OF THE CONTRACT DOCUMENTS (INCLUDING, WITHOUT LIMITATION, AIA DOCUMENT A101-2017 AND AIA DOCUMENT A201-2017, AS EACH MAY BE MODIFIED BY THIS RIDER), THIS RIDER CONTROLS. THIS PARAGRAPH IS STATED IN ALL CAPITAL LETTERS AND IS INITIALED AS CONFIRMATION OF THE PARTIES' UNDERSTANDING OF THE PRECEDENCE THIS RIDER TAKES OVER ANY OTHER PROVISION OF THE CONTRACT DOCUMENTS.

_____	_____
Contractor (Initial)	Owner (Initial)
Date Initialed: _____	Date Initialed: _____

CONTRACTOR TBD	BOARD OF LIBRARY TRUSTEES LAKE FOREST PUBLIC LIBRARY
By: _____	By: _____ President, Board of Library Trustees
Date Signed: _____, 2026	Date Signed: _____, 2026

END OF SECTION

PART 1 GENERAL

1.1 BONDS

A. Furnish the following with executed Owner-Contractor Agreement.

1. Performance and Payment Bonds: Use AIA Document A312-2010, Performance Bond and Payment Bond.

1.2 INSURANCE CERTIFICATES

A. Furnish the following with executed Owner-Contractor Agreement.

1. Certificates of Insurance: Use ACORD 25 (2016/03), Certificate of Liability Insurance and ACORD 27 (2016/03), Certificate of Property Insurance, with AIA Document G715-2017, Supplemental Attachment, or another pre-approved form.

END OF SECTION

PART ONE GENERAL

1.1 GENERAL CONDITIONS

A. General Conditions are AIA Document A201-2017, General Conditions of the Contract for Construction. Free sample preview of the document are avaliable at www.aiacontracts.org.

END OF SECTION

PART 1 GENERAL

1.1 INSURANCE AND BONDS

A. Owner/Contractor Agreement form shall include AIA Document A101-2017 Exhibit A, Insurance and Bonds. Free sample previews of the document are available at www.aiacontracts.org.
B. Terms Architect, Engineer, and Architect/Engineer are used interchangeably.
C. Bond surety company shall be satisfactory to Owner.
D. Include costs for bonds and insurance in Bid.
E. Attorneys-in-Fact who sign bonds shall file with each bond a certified copy of their Power of Attorney, with effective date.

1.2 INSURANCE REQUIREMENTS

A. See Section 00 52 00 - Rider to A101-2017

END OF SECTION

PART 1 GENERAL

1.1 PROJECT INFORMATION

A. Project Name: Lake Forest Library, Historic Rooms Revitalization
B. Owner: Lake Forest Library
C. Project Address: 360 E. Deerpath Road, Lake Forest, IL 60045
D. Owner's Sales Tax Exemption Number: E99004777
E. Vinci | Hamp Architects' Project Number: 2504

1.2 PROJECT DESCRIPTION

A. The project revitalizes the Library's original 1931 historic rooms. Work includes the restoration and renovation of architectural finishes, new millwork, carpet, lighting, and changes to existing electrical, data, HVAC, and fire protection systems. Improvements will enhance the flexibility and functionality of the spaces, while preserving the historic character and craftsmanship of the original building by architect Edwin Clark.
B. DESCRIPTION OF ALTERATIONS WORK
   1. Scope of selective demolition and removals is indicated on Drawings and specified in Section 02 41 00.
   2. Scope of alterations work is indicated in drawings.
      Renovate the following areas, complete including mechanical and electrical work and finishes:
      a. Exterior Front Door
      b. Vestibule
      c. Foyer
      d. Rotunda
      e. Friends Reading Room
      f. Adult Services/Reference Room
      g. Reference Annex
      h. Business Collection Room (Selective Demolition and carpet only)
   3. Plumbing: No direct work; however, keep existing in operation.
   4. HVAC: Alter existing system for new diffusers and grilles, keeping existing in operation.
   5. Electrical Power and Lighting: Alter existing system and add new construction, keeping existing in operation.
   6. Fire Suppression Sprinklers: Alter existing system's sprinkler heads in project spaces, keeping existing in operation.
   7. Fire Alarm: Alter existing system and add new construction, keeping existing in operation.
   8. Telephone: Alter existing system and add new construction, keeping existing in operation.
   9. Security System: Alter existing system and add new construction, keeping existing in operation.

1.3 WORK BY OWNER

A. Owner will supply and install the following:
   1. Furnishings
   2. Computer and related IT equipment
   3. Artwork

1.4 OWNER OCCUPANCY

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

B. Review project phasing plan indicated on Drawings.
C. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
D. Schedule the Work to accommodate Owner occupancy.

1.5 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 and building.
B. Arrange use of site and premises to allow:
   1. Owner occupancy.
   2. Use of site and premises adjacent to construction zone by Owner and library patrons.
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 and exterior courtyards may not be used for storage.
E. Time Restrictions:
   1. Limit conduct of especially noisy exterior work to the hours of 7 AM to 7 PM .
F. Utility Outages and Shutdown:
   1. Limit disruption of utility services to hours the building is unoccupied.
   2. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without seven (7) days notice to Owner and authorities having jurisdiction.
   3. Arrange any shutdown of utility services at least 24 hours in advance with Owner.
   4. Prevent accidental disruption of utility services to other facilities.

1.6 PHASING OF WORK

A. Construct Work in phases during construction, as described on drawing G-01.
B. Coordinate construction schedule and operations with Owner.

1.7 NOTICE TO PROSPECTIVE BIDDERS

A. These documents constitute an Invitation to Bid to and request for qualifications from General Contractors for the construction of the project described below.

1.8 CONTRACT DESCRIPTION

A. Contract Type: A single prime contract based on a Stipulated Price as described in Document 00 52 00 - Agreement Form.
B. The work of this contract is identified in this section and on Drawings.

1.9 PROCUREMENT TIMETABLE

A. Mandatory Project Walk Through: Tuesday October 27, 2026 at 1:00 PM Central time
B. Last Request for Substitution Due: 7 days prior to due date of bids.
C. Last Request for Information Due: 7 days prior to due date of bids.
D. Bid Due Date: Friday November 20, 2026 before 5 PM Central time.
E. The Owner reserves the right to change the schedule or terminate the entire procurement process at any time.

1.10 PROCUREMENT DOCUMENTS

A. Availability of Documents: Bid documents are being provided in electronic format. Printed copies may be obtained from the Architect for $400.00 per set.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

PART 1 GENERAL

1.1 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. Correlation of Contractor submittals based on changes.
E. Procedures for preparation and submittal of application for final payment.

1.2 RELATED REQUIREMENTS

A. Section 00 52 00 - Agreement Form: Contract Sum, retainages, payment period, monetary values of unit prices.
B. Section 00 72 00 - General Conditions: Additional requirements for progress payments, final payment, changes in the Work.

1.3 SCHEDULE OF VALUES

A. Use Schedule of Values Form: AIA G703, edition stipulated in the Agreement.
B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.
C. Forms filled out by hand will not be accepted.
D. Submit Schedule of Values in duplicate within 15 days after date of Owner-Contractor Agreement.
E. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification section. Identify site mobilization.
F. Include in each line item, the amount of Allowances specified in this section. For unit cost Allowances, identify quantities taken from Contract Documents multiplied by the unit cost to achieve the total for the item.
G. Include separately from each line item, a direct proportional amount of Contractor's overhead and profit.
H. Revise schedule to list approved Change Orders, with each Application For Payment.

1.4 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Period: Submit at intervals stipulated in the Agreement.
B. Use Form AIA G702 and Form AIA G703, edition stipulated in the Agreement.
C. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.
D. Forms filled out by hand will not be accepted.
E. For each item, provide a column for listing each of the following:
    1. Item Number
    2. Description of work
    3. Scheduled Values
    4. Previous Applications
    5. Work in Place and Stored Materials under this Application
    6. Authorized Change Orders
    7. Total Completed and Stored to Date of Application
    8. Percentage of Completion
    9. Balance to Finish
    10. Retainage
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 one (1) electronic and three (3) hard-copies of each Application for Payment.
J. Include the following with the application:
   1. Transmittal letter as specified for submittals in Section 01 30 00.
   2. Construction progress schedule, revised and current as specified in Section 01 30 00.
   3. Partial release of liens from major subcontractors and vendors.
   4. Affidavits attesting to off-site stored products.
K. When Architect 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.

1.5 MODIFICATION PROCEDURES

A. Submit name of the individual authorized to receive change documents and who will be responsible for informing others in Contractor's employ or subcontractors of changes to Contract Documents.
B. For minor changes not involving an adjustment to the Contract Sum or Contract Time, Architect will issue instructions directly to Contractor.
C. For other required changes, Architect will issue a 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 a document that includes a detailed description of a proposed change with supplementary or revised drawings and specifications, a change in Contract Time for executing the change with a stipulation of any overtime work required and the period of time during which the requested price will be considered valid. Contractor shall prepare and submit a fixed price quotation within 10 days.
E. Contractor may propose a change by submitting a 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. Document any requested substitutions in accordance with Section 01 60 00.
F. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.
   1. For change requested by Architect for work falling under a fixed price contract, the amount will be based on Contractor's price quotation.
   2. For change requested by Contractor, the amount will be based on the Contractor's request for a Change Order as approved by Architect.
   3. For pre-determined unit prices and quantities, the amount will be based on the fixed unit prices.
   4. 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. On request, provide the 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, similarly documented.
   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.

H. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

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.

1.6 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.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES
- A. General administrative requirements
- B. Electronic document submittal service
- C. Preconstruction meeting
- D. Site mobilization meeting
- E. Progress meetings
- F. Construction progress schedule
- G. Contractor's daily reports
- H. Progress photographs
- I. Coordination drawings
- J. Submittals for review, information, and project closeout
- K. Number of copies of submittals
- L. Requests for Information (RFI) procedures
- M. Submittal procedures

1.2 RELATED REQUIREMENTS
- A. Section 00 72 00 - General Conditions: Dates for applications for payment.
- B. Section 01 60 00 - Product Requirements: General product requirements.
- C. Section 01 70 00 - Execution and Closeout Requirements: Additional coordination requirements.
- D. Section 01 78 00 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

1.3 GENERAL ADMINISTRATIVE REQUIREMENTS
- A. Comply with requirements of Section 01 70 00 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.
- B. Make the following types of submittals to Architect:
  1. Requests for Information (RFI)
  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

3.1 ELECTRONIC DOCUMENT SUBMITTAL SERVICE
- A. All documents transmitted for purposes of administration of the contract are to be in electronic (PDF, MS Word, or MS Excel) format, as appropriate to the document, and transmitted via an Internet-based submittal service that receives, logs and stores documents, provides electronic stamping and signatures, and notifies addressees via email.
  1. Besides submittals for review, information, and closeout, this procedure applies to Requests for Interpretation (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 are required to use this service.
3. It is Contractor's responsibility to submit documents in allowable format.
4. Subcontractors, suppliers, and Architect's consultants are to be permitted to use the service at no extra charge.
5. 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.
6. Paper document transmittals will not be reviewed; emailed electronic documents will not be reviewed.
7. All other specified submittal and document transmission procedures apply, except that electronic document requirements do not apply to samples or color selection charts.

B. Cost: The cost of the service is to be paid by Contractor; include the cost of the service in the Contract Sum.

3.2 PRECONSTRUCTION MEETING

A. Schedule meeting after Notice of Award
B. Attendance Required:
   1. Owner
   2. Architect
   3. Contractor
C. Agenda:
   1. Execution of Owner-Contractor Agreement
   2. Submission of executed bonds and insurance certificates
   3. Distribution of Contract Documents
   4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule
   5. Submission of initial Submittal schedule
   6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures
   7. Scheduling
D. 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.

3.3 SITE MOBILIZATION MEETING

A. Schedule meeting at the Project site after Notice of Award.
B. Attendance Required:
   1. Contractor
   2. Owner
   3. Architect
   4. Contractor's superintendent
   5. Major subcontractors
C. Agenda:
   1. Use of premises by Owner and Contractor
   2. Owner's requirements
   3. Construction facilities and controls provided by Owner
   4. Temporary utilities provided by Owner
   5. Survey and building layout
   6. Security and housekeeping procedures

7. Schedules
8. Application for payment procedures
9. Procedures for testing
10. Procedures for maintaining record documents
11. Requirements for start-up of equipment
12. Inspection and acceptance of equipment put into service during construction period

D. Record minutes and distribute copies within two days after meeting to participants, with copies to Architect, Owner, participants, and those affected by decisions made.

3.4 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the work at weekly intervals.
B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
C. Attendance Required:
   1. Contractor
   2. Owner
   3. Architect
   4. Special consultants - when work related to their specialty is underway
   5. Contractor's superintendent
   6. Major subcontractors - depending on work currently underway
D. Agenda:
   1. Review minutes of previous meetings
   2. Review of work progress and schedule
   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 RFIs log and status of responses
   7. Review of off-site fabrication and delivery schedules
   8. Review project schedule and the impact of any proposed changes on overall schedule and project coordination.
E. 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.

3.5 CONSTRUCTION PROGRESS SCHEDULE

A. Within 10 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 20 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.
D. Within 10 days after joint review, submit complete schedule.
E. Submit updated schedule with each Application for Payment.

3.6 PROGRESS PHOTOGRAPHS

A. Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.
B. Submit new photographs at least once a month, within 3 days after being taken.
C. Maintain one set of all photographs at project site for reference; same copies as submitted, identified as such.
D. Photography Type: Digital; electronic files.

E. Provide photographs of site and construction throughout progress of work produced by a photographer acceptable to Architect.
F. Take photographs as evidence of existing project conditions as follows:
   1. Interior Views: Of work zone activities.
   2. Exterior Views: When related to work.

3.7 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:
   1. Product data
   2. Design data
   3. Shop drawings
   4. Samples for selection
   5. Samples for verification
B. Submit to Architect for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.
C. Samples will be reviewed for aesthetic, color, or finish selection.
D. After review, provide copies and distribute in accordance with Submittal Procedures article below (3.11) and for record documents purposes described in Section 01 78 00 - Closeout Submittals.

3.8 SUBMITTALS FOR INFORMATION

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

3.9 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 at project closeout in compliance with requirements of Section 01 78 00 - Closeout Submittals:
   1. Project record documents
   2. Operation and maintenance data
   3. Warranties
   4. Bonds

3.10 NUMBER OF COPIES OF SUBMITTALS

A. Electronic Documents: Submit one (1) electronic copy in PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected.

3.11 SUBMITTAL PROCEDURES

A. General Requirements:
   1. Use a single transmittal for related items.
   2. Transmit using approved form.
      a. Use form generated by Electronic Document Submittal Service software.
   3. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.

4. Identify: Project; Contractor; subcontractor or supplier; pertinent drawing and detail number; and specification section number and article/paragraph, as appropriate on each copy.
5. 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.
6. Deliver each submittal on date noted in submittal schedule, unless an earlier date has been agreed to by all affected parties, and is of the benefit to the project.
    a. Upload submittals in electronic form to Electronic Document Submittal Service website.
7. Schedule submittals to expedite the Project, and coordinate submission of related items.
    a. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
8. Identify variations from Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
9. When revised for resubmission, identify all changes made since previous submission.
10. Distribute reviewed submittals. Instruct parties to promptly report inability to comply with requirements.
11. 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.
12. Submittals not requested will not be recognized or processed.

B. Product Data Procedures:
1. Submit only information required by individual specification sections.
2. Collect required information into a single submittal.
3. Submit concurrently with related shop drawing submittal.
4. Do not submit (Material) Safety Data Sheets for materials or products.

C. Shop Drawing Procedures:
1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting Contract Documents and coordinating related work.
2. Do not reproduce Contract Documents to create shop drawings; such drawings will be rejected.
3. Generic, non-project-specific information submitted as shop drawings do not meet the requirements for shop drawings.

D. Samples Procedures:
1. Transmit related items together as single package.
2. Identify each item to allow review for applicability in relation to shop drawings showing installation locations.

3.12 SUBMITTAL REVIEW

A. Submittals for Review: Architect will review each submittal, and approve, or take other appropriate action.
B. Submittals for Information: Architect will acknowledge receipt and review. See below for actions to be taken.
C. Architect's actions will be reflected by marking each returned submittal using virtual stamp on electronic submittals.
1. Notations may be made directly on submitted items and/or listed on appended Submittal Review cover sheet.

D. Architect's and consultants' actions on items submitted for review:
1. Authorizing purchasing, fabrication, delivery, and installation:
    a. "Approved", or language with same legal meaning.

b. "Approved as Noted, Resubmission not required", or language with same legal meaning.
   1) At Contractor's option, submit corrected item, with review notations acknowledged and incorporated.
c. "Approved as Noted, Resubmit for Record", or language with same legal meaning.
   1) Resubmit corrected item, with review notations acknowledged and incorporated. Resubmit separately, or as part of project record documents.
   2) Non-responsive resubmittals may be rejected.

2. Not Authorizing fabrication, delivery, and installation:
   a. "Revise and Resubmit".
      1) Resubmit revised item, with review notations acknowledged and incorporated.
      2) Non-responsive resubmittals may be rejected.
   b. "Rejected".
      1) Submit item complying with requirements of Contract Documents.

E. Architect's and consultants' actions on items submitted for information:
   1. Items for which no action was taken:
      a. "Received" - to notify the Contractor that the submittal has been received for record only.
   2. Items for which action was taken:
      a. "Reviewed" - no further action is required from Contractor.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES
- A. Preliminary schedule.
- B. Construction progress schedule, bar chart type.

1.2 RELATED REQUIREMENTS
- A. Section 01 10 00 - Project Summary: Work sequence.

1.3 SUBMITTALS
- A. Within 10 days after date of Agreement, submit preliminary schedule.
- B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
- C. Submit updated schedule with each Application for Payment.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 PRELIMINARY SCHEDULE
- A. Prepare preliminary schedule in the form of a horizontal bar chart.

3.2 CONTENT
- A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.
- B. Identify each item by specification section number.
- C. Identify work of separate stages and other logically grouped activities.
- D. Provide sub-schedules to define critical portions of the entire schedule.
- E. Provide legend for symbols and abbreviations used.

3.3 BAR CHARTS
- A. Include a separate bar for each major portion of Work or operation.
- B. Identify the first work day of each week.

3.4 REVIEW AND EVALUATION OF SCHEDULE
- A. Participate in joint review and evaluation of schedule with Architect at each submittal.
- B. Evaluate project status to determine work behind schedule and work ahead of schedule.
- C. After review, revise as necessary as result of review, and resubmit within 10 days.

3.5 UPDATING SCHEDULE
- A. Maintain schedules to record actual start and finish dates of completed activities.
- B. Indicate progress of each activity to date of revision, with projected completion date of each activity.
- C. Indicate changes required to maintain Date of Substantial Completion.

3.6 DISTRIBUTION OF SCHEDULE
- A. Distribute copies of updated schedules to Contractor's project site file, to subcontractors, suppliers, Architect, Owner, and other concerned parties.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Security measures include Owner's security program, entry control, and other security issues.

1.2 RELATED REQUIREMENTS

A. Section 01 10 00 - Project Summary: Use of premises and occupancy.
B. Section 01 50 00 - Temporary Facilities and Controls: Temporary lighting.

1.3 SECURITY PROGRAM

A. Protect Work, existing premises and Owner's operations from theft, vandalism, and unauthorized entry.
B. Initiate program at project mobilization.
C. Initiate program in coordination with Owner's existing security protocols at project mobilization.
D. Maintain program throughout construction period until Owner occupancy.

1.4 ENTRY CONTROL

A. Restrict entrance of persons and vehicles into Project site and existing facilities.
B. Allow entrance only to authorized persons.
C. Maintain log of workers and visitors, make available to Owner on request.
D. Owner will control entrance of persons and vehicles related to Owner's operations.

1.5 BACKGROUND CHECKS

A. Contractor is responsible for performing background checks for each of their employees and requiring the same from their sub-contractors. Documentation should be available to Owner if necessary.

1.6 RESTRICTIONS

A. Do not allow cameras on site or photographs taken except by written approval of Owner.
B. Do no work on Sundays.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Construction procedures appropriate for working with historic sites and structures.
B. Special procedures required for items and features of historical significance and value requiring special treatment.

1.2 RELATED REQUIREMENTS

A. Section 01 10 00 - Project Summary: Contract descriptions, description of alterations work, work by others, future work, occupancy conditions, use of site and premises, and work sequence.
B. Section 01 57 20 - Dust and Noise Control Procedures: Dust and noise control, negative air flow and air filtration as related to period treatments.
C. Section 02 41 00 - Demolition: Selective removal of nonhistoric elements.

1.3 DEFINITIONS

A. Consolidate: Strengthen loose or deteriorated materials in situ.
B. Dismantle: Disassemble and detach items by hand from existing construction to the limits indicated, using small hand tools and small one-hand power tools, to protect nearby historic surfaces, and legally dispose of dismantled items off-site, unless indicated to be salvaged or reinstalled.
C. Existing to Remain: Existing items that are not to be removed or dismantled. Protect materials as indicated.
D. Historic: Spaces, areas, rooms, surfaces, materials, finishes, and overall appearance subject to preservation, rehabilitation, restoration, and reconstruction procedures defined in NPS (THP). Designation “HF” and words such as “historic,” “historic fabric,” “historic materials,” “historic building materials,” 'historic character,' or words of similar meaning indicate that the material or feature is considered to have aspects that require period treatment procedures.
E. In-Kind: Matching existing in physical and visual aspects including, but not limited to, material, form, color, texture, and workmanship.
F. Matching: Blending with adjacent construction and showing no apparent difference in material type, form, detail, color, texture, finish, or other visible and readily discernible characteristics, as determined and approved by Architect.
G. Preserve: Apply measures to sustain existing form, integrity, and materials of a historic property; may include preliminary measures to protect and stabilize the property.
H. Protect: Take precautions to keep historic materials of the building from damage or injury.
I. Reconstruct: Remove existing item, refurbish existing or replicate damaged or missing components as indicated or directed, and reinstall in original position.
J. Refinish: Remove existing finishes from base material and apply new finish to match original or as otherwise indicated.
K. Remove: Detach or dismantle items from existing construction and dispose of them off-site, unless items are indicated to be salvaged or reinstalled.
L. Remove and Reinstall: Detach or dismantle items from existing construction in a manner to prevent damage. Clean and prepare for reuse and reinstall in original location or in other location where indicated.
M. Remove and Salvage: Detach or dismantle items from existing construction in a manner to prevent damage. Clean, package, label, and deliver salvaged items to Owner in ready-for-reuse condition.
N. Repair: Correct damage and defects, retaining existing materials, features, and finishes and employing as few new materials as possible. Includes patching, piecing-in, splicing, consolidating, or reinforcing or upgrading materials with appropriate and approved materials and methods.

O. Replace: Remove, duplicate, and reinstall entire item with new material. Use original item as the pattern unless noted otherwise.
P. Replicate or Reproduce: Fabricate a new item in exact detail, materials, and finish as the original, unless otherwise indicated; referred to as replicas or reproductions.
Q. Restore: Return to original condition; return to the condition extant during the period of interpretation.
R. Retain: Existing to remain; keep existing items that are not to be removed or dismantled.
S. Reversible: New construction work, treatment, or processes that can be removed or undone in the future without damaging historic materials.
T. Stabilize: Provide reinforcement of unsafe or deteriorated items and maintain the present, essential form; reestablish weather-resistant enclosure.
U. Strip: Remove existing finish down to base material, unless otherwise indicated.

1.4 REFERENCE STANDARDS

A. NPS (THP) - The Secretary of The Interior's Standards For the Treatment of Historic Properties with Guidelines For Preserving, Rehabilitating, Restoring & Reconstructing Historic Buildings; 2017.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by affected installers.
B. Sequencing: Ensure that facility services and utility connections are achieved in an orderly and expeditious manner.

1.6 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
B. Quality Control Submittals:
    1. Practices and Treatments: Use NPS recommendations as a general guide for proposed practices and treatments, modified as necessary to suit project requirements and conditions.
    2. Phase Programs: Submit program, in writing, for each phase of period treatment procedures, indicating:
        a. Protection of surrounding materials.
        b. Materials, methods, and equipment to be used.
C. Project supervisor's qualification statement.
D. Existing Conditions Documentation: Prior to commencement of construction activities, document with digital photography, digital videography, or similar means the existing interior walls, windows, doors, interior finishes, trim, and decorative elements, including decorative and functional grilles, historic light fixtures and in-place art objects, indicated as subject to period treatment or protection.
E. Project Record Documents:
    1. Record of conditions encountered before, during, and after completion of work.

1.7 QUALITY ASSURANCE

A. Project Supervisor: Master craftsperson with at least five years of documented experience in leading historic preservation work similar in size and scope to this project.
    1. Be present when a craftsperson begins to perform the work; explain the intended procedures.
    2. Supervise and actively participate in specific procedures.
B. Craftspersons: Perform specific cleaning, repairing, and refinishing tasks; have demonstrated applicable successful experience in past historical preservation and restoration projects.
C. Documents at Project Site: Maintain at the project site a copy of the referenced Construction Documets for execution requirements.

1.8 MOCK-UPS

A. See Section 06 03 00 - Architectural Woodwork Restoration for additional requirements.
B. Arrange for one or more demonstration mock-ups, size and location to be determined in the field, four feet long by four feet wide, using each type of proposed cleaning, repairing, and refinishing materials and methods.
    1. Refer to related technical period treatment sections for additional mock-up requirements.
    2. Perform demonstrations in presence of Architect.
    3. Proceed with mock-up work only after initial approval of proposed materials and methods by Architect.
        a. Maintain the mock-up in its approved condition until final acceptance of the completed work.
C. Locate where directed.
D. Mock-ups, if approved, may remain as part of the work.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Storage and Protection:
    1. Use and reuse materials original to the existing structure wherever practical. Store removed materials, and protect from damage.
    2. Label specific pieces or items to be removed. Label consistently and inconspicuously indicating original location, and document original position.
    3. Store restoration and cleaning chemicals off-site or in metal cabinets on-site. Do not leave cans open or out of the cabinet overnight. Do not store in unlabeled containers.

PART 2 - PRODUCTS

2.1 PROTECTION PRODUCTS

A. Temporary Interior Enclosures: See Section 01 50 00 - Temporary Facilities and Controls.
B. Adhesive Walk-Off, Tacky Mats: Mats with multiple layers of disposable, adhesive-coated sheets.
    1. Sheet Material: Polyethylene film.
    2. Adhesive: Acrylic.
    3. Applications: Indoor.
    4. Nominal Mat Size: Contractor's option, to provide adequate dirt trapping.
    5. Color: Blue.
C. Low-Tack Sealant: Temporary, flexible, watertight and weather-resistant seal, and removable without marring substrates for a period of up to 6 months.
    1. Low Temperature Flexibility: Pass at 32 degrees F, tested in accordance with ASTM C734.
    2. Color: Clear.

2.2 CLEANING MATERIALS

A. General: Do not use incompatible materials that may contribute to damage of the element being cleaned.
B. Use products specifically intended by the manufacturer for cleaning historic materials or elements.

2.3 REPAIR MATERIALS

A. General: Do not use incompatible materials contributing to damage of repaired elements.
B. Matching: Unless otherwise required, use new materials that match historic materials in type, design, dimension, texture, detailing, and external appearance.

2.4 REFINISHING MATERIALS

A. General: Do not use incompatible materials that may contribute to damage of the element being refinished.
B. Matching: Unless otherwise required, use new materials that match historic materials in type, design, texture, detailing, and external appearance.

PART 3 - EXECUTION

3.1 PREPARATION

A. Dismantling: Follow the reverse order of original construction to the extent practicable.

3.2 PERIOD TREATMENT SPECIAL PROCEDURES

A. Period Treatment Work: Select repair means and methods based on minimal disturbance of existing materials, systems, and assemblies.
B. Review proposed procedures for each type of element with Architect. Obtain Architect's approval before commencing work.
C. Salvage as much existing material of each element as practicable; repair, consolidate, and restore rather than renew.
D. Repair rather than replace architectural features wherever possible. Repair or replace missing features with accurate duplications.
E. Use reversible processes wherever possible.
F. Use methods that do not significantly change the aesthetic effect of existing elements.
G. Document condition of items being worked on before, during, and after work is completed.
H. Protect existing materials and substrates from damage.
I. Interior Work Procedures: Protect parts of the facility not being cleaned or repaired from effects of this work.
    1. Provide enclosures to protect against spread of dust, debris, and water at or beyond the work area.
    2. Mask or cover adjacent surfaces and permanent equipment. Secure coverings; do not use adhesive type tape or nails. Do not use impervious sheeting.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES
- A. Submittals
- B. Quality assurance
- C. References and standards
- D. Contractor's design-related professional design services
- E. Control of installation
- F. Mock-ups
- G. Tolerances
- H. Manufacturers' field services
- I. Defect Assessment

1.2 RELATED REQUIREMENTS
- A. Document 00 72 00 - General Conditions: Inspections and approvals required by public authorities
- B. Section 01 30 00 - Administrative Requirements: Submittal procedures
- C. Section 01 60 00 - Product Requirements: Requirements for material and product quality

1.3 REFERENCE STANDARDS
- A. ASTM C1021 - Standard Practice for Laboratories Engaged in Testing of Building Sealants; 2008 (Reapproved 2023).
- B. ASTM E543 - Standard Specification for Agencies Performing Nondestructive Testing; 2026.
- C. ASTM E699 - Standard Specification for Agencies Involved in Testing, Quality Assurance, and Evaluating of Manufactured Building Components; 2016.
- D. IAS AC89 - Accreditation Criteria for Testing Laboratories; 2025.

1.4 DEFINITIONS
- A. Contractor's Professional Design Services: Design of some aspect or portion of the project by party other than the design professional of record. Provide these services as part of the Contract for Construction.
  1. Design Services Types Required:
     a. Design-Related: Design services explicitly required to be performed by another design professional due to highly-technical and/or specialized nature of a portion of the project. Services primarily involve engineering analysis, calculations, and design, and are not intended to alter the aesthetic aspects of the design.
- B. Design Data: Design-related, signed and sealed drawings, calculations, specifications, certifications, shop drawings and other submittals provided by Contractor, and prepared directly by, or under direct supervision of, appropriately licensed design professional.

1.5 CONTRACTOR'S DESIGN-RELATED PROFESSIONAL DESIGN SERVICES
- A. Scope of Contractor's Professional Design Services: Provide for the following items of work:
  1. Structural Design of Metal Fabrications: As described in Section 05 50 00 - Metal Fabrications

1.6 SUBMITTALS
- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Designer's Qualification Statement: Submit for Architect's knowledge as contract administrator, or for Owner's information.

1. Include information for each individual professional responsible for producing, or supervising production of, design-related professional services provided by Contractor.
   a. Full name
   b. Professional licensure information
   c. Statement addressing extent and depth of experience specifically relevant to design of items assigned to Contractor

C. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing compliance with information given and the design concept expressed in the Contract Documents, or for Owner's information.
   1. Include calculations that have been used to demonstrate compliance to performance and regulatory criteria provided, and to determine design solutions.
   2. Include required product data and shop drawings.
   3. Include a statement or certification attesting that design data complies with criteria indicated, such as building codes, loads, functional, and similar engineering requirements.
   4. Include signature and seal of design professional responsible for allocated design services on calculations and drawings.

D. Certificates: When specified in individual specification sections, submit certification by the manufacturer or installation/application subcontractor in quantities specified for Product Data.
   1. Indicate material or product complies with 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.

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

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 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.

3.2 MOCK-UPS

A. Before installing portions of the Work where mock-ups are required, construct mock-ups in location and size indicated for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work. The purpose of mock-up is to demonstrate the proposed range of aesthetic effects and workmanship.

B. Accepted mock-ups establish the standard of quality the Architect will use to judge the Work.
C. Obtain Architect's approval of mock-ups before starting work, fabrication, or construction.
D. Architect will use accepted mock-ups as a comparison standard for the remaining Work.

3.3 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.

3.4 MANUFACTURERS' FIELD SERVICES

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

3.5 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not complying with specified requirements.
B. If, in the opinion of Architect, it is not practical to remove and replace the work, Architect will direct an appropriate remedy or adjust payment.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES
- A. Temporary utilities
- B. Temporary interior lighting
- C. Temporary sanitary facilities
- D. Exterior barriers and ground protection
- E. Art protection
- F. Interior enclosures
- G. Vehicular access and parking
- H. Waste removal
- I. Project identification sign
- J. Field offices

1.2 RELATED REQUIREMENTS
- A. Section 01 35 53 - Security Procedures
- B. Section 01 57 20 - Dust/Noise Control Procedures

1.3 REFERENCE STANDARDS
- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026a.

1.4 TEMPORARY UTILITIES
- A. Owner will provide the following:
  1. Electrical power, consisting of connection to existing facilities.
  2. Water supply, consisting of connection to existing facilities.
  3. Heat in construction areas supplied by Owner's exisiting steam system; coordinate with Owner.
  4. Existing HVAC system may not be used in construction areas.

1.5 TEMPORARY INTERIOR LIGHTING
- A. Provide and maintain temporary lighting for interior spaces under construction. All rooms will have existing down lights removed and replaced. In addition, each room's historic pendants are to be removed for restoration.
- B. Contractor shall provide light fixtures sufficient for construction activiteis to proceed when spaces are under construction and also for when the Owner will conduct business in these same spaces when not under construction.
- C. Contractor to provide temporary lighting plan with fixtures and light levels specified for Owner approval.

1.6 TEMPORARY SANITARY FACILITIES
- A. Use of existing back of house toilet facilities permitted, as directed by Owner.
- B. Maintain daily in clean and sanitary condition.
- C. At end of construction, return facilities to same or better condition as originally found.

1.7 EXTERIOR BARRIERS & GROUND PROTECTION
- A. Provide exterior barriers as needed to prevent unauthorized entry to interior construction areas, to prevent access to areas that could be hazardous to workers, library staff or the public, to allow for Owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations.
- B. Provide protection for exterior courtyard components, including gates, courtyard walls and paving. No storage of materials or waste allowed in courtyards.

1. Protect courtyard paving with 1/2 inch minimum plywood over one 1inch rigid insulation.

C. Provide protection for exisitng courtyard planting. Replace damaged plants.
D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.8 ART PROTECTION

A. Protection or removal of the following items of artwork will remain protected in place or be removed for conservation or storage by Owner:
   1. Remizov murals, located in Rotunda: Protected in place
   2. Bas-relif panel of Archer, located in Rotunda: Protected in place
   3. Joseph Addison portrait, located in Reference Annex: Remove for conservation.
   4. Needlepoint Tapestry, located in Business Collection: Remove for storage.
B. Contractor to coordinate with Owner on Owner's artwork protection and removal activities.

1.9 INTERIOR ENCLOSURES

A. Provide temporary partitions and ceilings as indicated to separate work areas from Owner-occupied areas, to prevent penetration of dust, odors and moisture into Owner-occupied areas, and to prevent damage to existing materials and equipment.
   1. Owner desires pre-fabricated and finished temporary construction partitions and doors to separate construction zones from public-facing spaces:
      a. Doors to have push button lever access.
      b. STC rating of 35 in accordance with ASTM E90.
      c. Maximum flame spread rating of 75 in accordance with ASTM E84.
   2.

1.10 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 with Owner for contractor parking
   1. Existing parking areas located nearby will be available for contractor parking.
C. Provide and maintain access to fire hydrants, free of obstructions.
D. Coordinate with Owner for contractor parking access with governing authorities and Owner.
E. Existing driveways shall not be used for construction traffic.
F. Do not allow vehicle parking on existing pavement.

1.11 WASTE REMOVAL

A. Coordinate with Owner regarding all aspects of waste removal.
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 weekly.
D. Prepare recycling plan for recyclable construction waste, Coordinate with Owner's Building Superintendent.
E. If materials to be recycled must be stored on-site, provide suitable non-combustible containers; locate containers holding flammable material outside the structure unless otherwise approved by the authorities having jurisdiction.

1.12 PROJECT IDENTIFICATION AND SIGNAGE

A. Provide project identification sign of design, construction, and location approved by Owner.
B. No other signs are allowed without Owner permission except those required by law.

1.13 FIELD OFFICES

A. Office: Contractor office space to be provided by Owner in Library basement. Coordinate with Owner.

1.14 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.
D. Restore new permanent facilities used during construction to specified condition.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

PART 1 GENERAL

1.1 REQUIREMENTS INCLUDE

A. No demolition work shall be performed until all provisions of this section related to temporary partitions and air quality control have been satisfied.

1.2 RELATED REQUIREMENTS

A. Section 01 10 00 - Project Summary
B. Section 01 50 00 - Temporary Faciities and Controls
C. Section 01 70 00 – Execution and Closeout Requirements

1.3 WORK DESCRIPTION

A. The work shall include, but not be limited to dust and noise control measures pertaining to the following:
    1. Location of and erection methods for interim dust and noise barriers, preceding demolition and construction activities in work areas.
    2. Negative air flow ventilation and air flow filtration within construction areas, including area of stripping and refinishing of oak paneled walls.
    3. Debris removal.
    4. Dust/debris/noise control.
    5. Equipment removal procedures.
    6. Cleaning frequency at dust barrier entrances.
    7. Circulation control patterns for construction personnel.

1.4 QUALITY CONTROL

A. Perform all work pertaining to dust and noise control measures in accordance with applicable federal, state, and local requirements.
B. Provide construction grade negative air machines with exhaust fan and filtration equipment that comply with the following standards:
    1. American National Standard Institute (ANSI)
    2. ANSI Z9.2: Fundamentals Governing Design and Operation of Local Exhaust Systems.
C. Provide daily testing of impervious construction barriers to verify that they are negatively pressurized with respect to adjacent areas.

1.5 SUBMITTALS

A. Prior to starting work, submit for review and approval by Owner and Architect, an outline of proposed equipment and/or procedures showing compliance with specification for each of the following:
    1. Systems, arrangements and locations of interim and impervious dust barriers.
    2. Clean-up, debris removal, and dust/debris control systems.
    3. Circulation control patterns to and from work areas for construction personnel and materials.
    4. Filtered vacuum equipment, ventilation equipment, and filtration equipment.

PART 2 PRODUCTS

2.1 MATERIALS/EQUIPMENT

A. HEPA Filters: High efficiency particulate absolute (HEPA) filter capable of trapping and retaining 99.9% of airborne particles greater than 0.3 microns in diameter.
B. HEPA Vacuum Equipment: Vacuuming equipment with a HEPA Filter System.

C. Temporary local exhaust ventilation system equipped with HEPA Filtration System complying with ANSI Z 9.2., capable of maintaining a minimum negative pressure differential of minus 0.02 inches of water column relative to adjacent unsealed areas.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

A. Access for Work:
   1. All construction access shall be limited to areas within the construction limits as designated by Owner and Architect. All requests for access into other, existing non-construction areas of the Library shall be in writing to Owner and Architect with sufficient prior notice. Permission for access is not guaranteed.
      a. Construction access shall be via designated point of entry.

B. Dust and Debris Control Measures Prior to Start of Construction:
   1. Coordinate with Owner's Building Superintendent for the maintenance of existing ventilation systems likely to be affected by construction.
   2. Verify with Building Superintendent that air is not being circulated from construction areas into other tenant areas.
   3. Provide carpet or adhesive mats at entrances to construction areas for duct collections from shoes.
   4. At final completion of construction, review and ensure that ventilation systems are balanced as specified and all filters of impacted equipment have been replaced.

C. Dumpster location and debris removal:
   1. Debris Removal: All construction debris shall be removed in manageable sized pieces. Move all debris to the disposal dumpster in a manner to prevent release of dust.
   2. All debris removal which must traverse areas of the occupied portion of the building must take place before or after regular working hours (no debris removal through the building from 9:00 a.m. to 9:00 p.m.) unless approved in advance by Owner’s Building Superintendent.
   3. Construction debris dumpster location shall be approved by Building Superintendent.
   4. All construction dumpsters shall remain closed and covered.

D. Construction Noise and Restrictions:
   1. All construction noise shall be kept to a minimum.
   2. All demolition or construction activities that generate a great deal of noise (i.e. core drillers, shot type anchors, concrete saws, etc.) shall be scheduled after 9 pm and before 9 am. Noise-generating work must be scheduled and submitted 7 days in advance in writing for approval by the Owner’s Building Superintendent to minimally disturb adjacent library areas.

E. Utility Connections/Disconnections:
   1. Contractor shall locate and identify all utility services passing through the construction area that serve other areas of the building outside the construction limits. Services to areas outside construction limits shall be maintained uninterrupted. Where necessary to disrupt services for short periods to complete connections, these shall be arranged to be made at the convenience of the building occupants and the Contractor shall provide a (7) day notice to the Owner and obtain written authorization. When transient services must be interrupted, Contractor shall provide temporary services for affected areas outside contract limits.
   2. Utility connections/disconnections and relocations shall be planned to be accomplished at periods other than regular working hours and all proposals shall be prepared accordingly to include all premium and overtime allowances and any other expenses as required.
   3. All work shall be so planned and executed as to provide continuous service of all main and branch line utilities for affected areas outside contract limits throughout the construction period.

F. Temporary Partitions:
   1. See Section 01 50 00 - Temporary Facilities and Controls, article 1.8 for temporary interior enclosures and doors.
   2. During the execution of the work, primary consideration shall be given to the protection of adjacent areas from all hazards associated with demolition and new construction work. Provide and maintain smoke-tight temporary partitions/dust barriers of type and at locations as indicated on the Drawings, adequate to keep dirt, dust, noise, and other particles from being transferred to adjacent areas. All doors through these partitions shall be equipped with dust proof weather-stripping and a closer. Any damage to temporary partitions shall be immediately repaired, or partitions replaced to the satisfaction of the Architect at no additional cost to the Owner.
   3. Interim Dust Barriers: Prior to erection and demolition of temporary partitions around construction areas, Contractor shall install an interim air-tight reinforced plastic dust abatement curtain approximately four (4) feet outside construction limits at existing corridors to isolate tenant units from area of work.
   4. Dust abatement curtain shall be completely taped to walls, floor and ceiling with appropriate tape proven not to damage existing surfaces.
   5. At completion of impervious dust barrier erection (or demolition), completely clean floor, ceiling and walls within 4'-0" limits using HEPA filtered vacuum equipment. Prior to removal of interim dust barrier obtain approval of Architect and Owner's Building Superintendent.
   6. Review interior and exterior perimeter of construction area for existing miscellaneous openings, penetrations, registers, doors, windows, and completely seal openings with solid barriers to confine construction dust, dirt, and air pollution to construction area.

G. Negative Air Flow Ventilation and Filtration within Construction Areas:
   1. Provide negative air pressure with HEPA filtered exhaust within the sealed off construction areas to allow for a direct removal of the dust and fumes associated with construction operations to the exterior of the building. Precautions shall be taken to avoid migration of the construction fumes into other occupied areas of the building. If temporary exhaust fans are used, vent filtered exhaust fan discharge directly to exterior and operate fan continuously for duration of construction while barriers are in place. Locate exhaust minimum 20 feet away from existing fresh air intakes.
   2. Maintain HEPA filters daily to prevent any discharge of dust particles to the exterior.
   3. Protect all exhaust air grilles with temporary filters.
   4. The industry's standard 2000 CFM Negative Air Machines with HEPA filters are to be used whenever visible dust or odor-creating construction activity is occurring. Contractor shall install the Negative Air Machines to be vented outdoors whenever odorous construction activity is occurring. If only dust generating activity is occurring, then the Negative Air Machine may be used as a recirculating filter within the space to clean the air and not exhausted outdoors.
   5. Contractor shall install an adequate quantity of Negative Air Machines to make the air clear, with no visible dust or opacity in the room. In order to achieve this, a single standard 2000 CFM Negative Air Machine will typically treat a room volume of 24,000 cubic feet and give the recommended 4 air changes per hour. Assuming a 15 foot high average ceiling, one Negative Air Machine will treat an area of 1600 square feet.
   6. Contractor shall keep the required quantity of Negative Air Machines in continuous operation in any area where any dust or odor generating activity is occurring.

H. Cleaning Frequency: Provide for daily cleaning around impervious barrier entrances to prevent construction dust from being tracked into adjacent areas.

I. The Contractor shall protect all corridors and rooms from stains, spills, tears, punctures, and damage of any kind. The Contractor is required to install a layer of 6 mil. Visqueen and ¼" masonite, seams sealed with duct tape, in all carpeted rooms in which they are working, or any room where damage is likely to occur. The Contractor is required to protect all surfaces from damage and must repair damage resulting from his activities.

3.2 SPECIAL REQUIREMENTS

A. Smoking Policy:

1. Smoking will not be permitted within area of construction. Anyone caught smoking is subject to immediate dismissal from the jobsite and will not be allowed to return.

B. No radios, “boom boxes”, or other ambient noise generators shall be operated within area of construction.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. General product requirements.
B. Re-use of existing products.
C. Maintenance materials, including extra materials, spare parts, tools, and software.

1.2 SUBMITTALS

A. 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.
B. 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.
C. 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.

PART 2 PRODUCTS

2.1 EXISTING PRODUCTS

A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by Contract Documents.
B. Unforeseen historic items encountered remain the property of the Owner; notify Owner promptly upon discovery; protect, remove, handle, and store as directed by Owner.
C. 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.
D. Specific Products to be Reused: The reuse of certain materials and equipment already existing on the project site is noted in the Contract Documents. If questions contact Architect.

2.2 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by Contract Documents.
B. Use of products having any of the following characteristics is not permitted:
    1. Made using or containing CFC's or HCFC's.
    2. Made of wood from newly cut old growth timber.
    3. Containing lead, cadmium, or asbestos.

2.3 PRODUCT OPTIONS

A. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.

2.4 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.
B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.1 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.

3.2 STORAGE AND PROTECTION

A. Store and protect products in accordance with manufacturers' instructions.
B. Store with seals and labels intact and legible.
C. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.
D. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.
E. Comply with manufacturer's warranty conditions, if any.
F. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
G. Prevent contact with material that may cause corrosion, discoloration, or staining.
H. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
I. 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

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.
B. Requirements for alterations work, including selective demolition, except removal, disposal, and/or remediation of hazardous materials and toxic substances.
C. Pre-installation meetings.
D. Cutting and patching.
E. Laying out the work.
F. Cleaning and protection.
G. Starting of systems and equipment.
H. Demonstration and instruction to Owner's personnel.
I. Closeout procedures, including Contractor's Correction Punch List.

1.2 RELATED REQUIREMENTS

A. Section 01 10 00 - Project Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.
B. Section 01 30 00 - Administrative Requirements: Submittals procedures.
C. Section 01 40 00 - Quality Requirements: Testing and inspection procedures.
D. Section 01 50 00 - Temporary Facilities and Controls: Temporary interior partitions; temporary heating, cooling, and ventilating facilities.
E. Section 01 78 00 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.
F. Section 01 79 00 - Demonstration and Training: Demonstration of products and systems to be commissioned and where indicated in specific specification sections

1.3 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2027.

1.4 SUBMITTALS

A. See Section 01 30 00 - 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. Integrity of weather exposed or moisture resistant element.
    3. Efficiency, maintenance, or safety of any operational element.
    4. Visual qualities of sight exposed elements.
    5. Include in request:
        a. Location and description of affected work.
        b. Necessity for cutting or alteration.
        c. Description of proposed work and products to be used.
        d. Alternatives to cutting and patching.
C. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.5 COORDINATION

A. 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.
B. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having

interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

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

2.1 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 60 00 - Product Requirements.

PART 3 EXECUTION

3.1 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. Verify that utility services are available, of the correct characteristics, and in the correct locations.
F. 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.

3.2 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.

3.3 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.

3.4 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.
B. 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.
C. 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.
D. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
E. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
F. Restore work with new products in accordance with requirements of Contract Documents.
G. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
H. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 84 00, to full thickness of the penetrated element.
I. 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.

3.5 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, basements, 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 daily and dispose off-site; do not burn or bury.

3.6 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.
B. Provide special protection where specified in individual specification sections.
C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
G. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

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

3.8 FINAL CLEANING
A. Use cleaning materials that are nonhazardous.
B. 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.
C. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
E. Replace filters of operating equipment.
F. Clean site; sweep paved areas, rake clean landscaped surfaces used in the performances of this work.
G. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.9 CLOSEOUT PROCEDURES
A. Make submittals that are required by governing or other authorities.
B. Accompany Architect 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. 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.
F. Correct items of work listed in Final Correction Punch List and comply with requirements for access to Owner-occupied areas.
G. Notify Architect when work is considered finally complete and ready for Architect's Substantial Completion final inspection.
H. Complete items of work determined by Architect listed in executed Certificate of Substantial Completion.

3.10 MAINTENANCE
A. Provide service and maintenance of components indicated in specification sections.
B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.
C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES
- A. Temporary protective coverings for installed floors, walls, ceilings and built-in objects.

1.2 RELATED REQUIREMENTS
- A. Section 01 70 00 - Execution and Closeout Requirements: Coordination of requirements for materials specified in this section.

1.3 REFERENCE STANDARDS
- A. ANSI A135.4 - Basic Hardboard; 2012 (Reaffirmed 2020).
- B. ASTM C208 - Standard Specification for Cellulosic Fiber Insulating Board; 2022.
- C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026a.
- D. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.
- E. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2023, with Errata.

1.4 SUBMITTALS
- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes available; and installation instructions.
- C. Shop Drawings: Indicate how existing finished surfaces are to be protected.

PART 2 PRODUCTS

2.1 GENERAL
- A. Provide materials that are easily removed without damage to the surfaces covered and with the following characteristics:
  1. Water resistant
  2. Vapor permeable
  3. Impact resistant
  4. Slip resistant
  5. Flame retardant
  6. Reduce transmitted noise

2.2 MATERIALS
- A. Sheet Materials for protection:
  1. Corrugated polypropylene sheet.
  2. Recycled paperboard/plastic composite sheet.
  3. Recycled paperboard sheet.
  4. Wood Hardboard: ANSI A135.4, tempered, 1/4 inch thick nominal.
  5. Plywood, 1/2 inch thick nominal.
  6. Fiberboard: ASTM C208, 1/2 inch thick nominal.
  7. Water Vapor Permeability: Conforming to ASTM E96/E96M.
  8. Flame Retardance: Meet requirements of NFPA 701.
  9. Surface Burning Characteristics: Maximum flame spread index of 25 and smoke developed index of 450; when system tested in accordance with ASTM E84.
- B. Rolled Materials:
  1. Self-adhering polyethylene film.
  2. Recycled cellulose fiberboard paper.

3. Rosin coated paper.
4. Water Vapor Permeability: Conforming to ASTM E96/E96M.
5. Flame Retardance: Meet requirements of NFPA 701.
6. Surface Burning Characteristics: Maximum flame spread index of 25 and smoke developed index of 450; when system tested in accordance with ASTM E84.

C. Corner and Door Jamb Protection Materials:
   1. Cardboard, shaped specifically for application and by it's dimensions.

D. Tape: Type recommended by protective covering material manufacturer.

PART 3 EXECUTION

3.1 PREPARATION

A. Remove dirt and debris from surfaces to be protected.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Overlap sheet materials to fit area to be covered.
C. Roll out and cut rolled materials to fit area to be covered.
D. Tape seams. Avoid taping directly to finished surfaces.
E. Stretch self-adhering film materials to completely cover surface.
F. Install door jamb protection to full height of opening.
G. Position corner and door jamb protection 0 inches above finished floor.

3.3 REMOVAL

A. Remove protective coverings prior to Date of Substantial Completion. Reuse or recycle materials if possible.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES
- A. Project record documents.
- B. Operation and maintenance data.
- C. Warranties and bonds.

1.2 RELATED REQUIREMENTS
- A. Section 00 72 00 - General Conditions: Performance bond and labor and material payment bonds, warranty, and correction of work.
- B. Section 01 30 00 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- C. Section 01 70 00 - Execution and Closeout Requirements: Contract closeout procedures.
- D. Individual Product Sections: Specific requirements for operation and maintenance data.
- E. Individual Product Sections: Warranties required for specific products or Work.

1.3 SUBMITTALS
- A. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.
- B. Operation and Maintenance Data:
  1. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
  2. 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.
  3. Submit two sets of revised final documents in final form within 10 days after final inspection.
- C. 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.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 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
- 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. Manufacturer's name and product model and number.
   2. Product substitutions or alternates utilized.
   3. Changes made by Addenda and modifications.

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

3.2 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.

3.3 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.
   2. Information for re-ordering custom manufactured products.

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.

3.4 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. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.

D. Include color coded wiring diagrams as installed.

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

3.5 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. 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.
C. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
D. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.
E. 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.
F. 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.
G. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.
H. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
I. Arrangement of Contents: Organize each volume in parts as follows:
    1. Project Directory.
    2. Table of Contents, of all volumes, and of this volume.
    3. Operation and Maintenance Data: Arranged by system, then by product category.
        a. Source data
        b. Product data, shop drawings, and other submittals
        c. Operation and maintenance data
        d. Field quality control data
        e. Photocopies of warranties and bonds

3.6 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. Include photocopies of each in operation and maintenance manuals, indexed separately on Table of Contents.
F. Manual: Bind in commercial quality 8-1/2 by 11 inch three D side ring binders with durable plastic covers.

G. 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.

H. 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.

I. 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.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

A. Demonstration of products and systems where indicated in specific specification sections.
B. Training of Owner personnel in operation and maintenance is required for:
   1. All software-operated systems.
   2. HVAC systems and equipment
   3. Electrical systems and equipment.
   4. Lighting control systems.
   5. Items specified in individual product Sections.
C. Training of Owner personnel in care, cleaning, maintenance, and repair is required for:
   1. Finishes, including flooring, wall finishes, ceiling finishes.
   2. Fixtures and fittings.
   3. Items specified in individual product Sections.

1.2 SUBMITTALS

A. Training Plans: Owner will designate personnel to be trained; tailor training to needs and skill-level of attendees.
   1. Submit not less than two weeks prior to start of training.
   2. Provide an overall schedule showing all training sessions.
   3. Include at least the following for each training session:
      a. Identification, date, time, and duration.
      b. Description of products and/or systems to be covered.
      c. Name of firm and person conducting training; include qualifications
      d. Intended audience, such as job description.
      e. Objectives of training.
B. Training Manuals: Provide training manual for each attendee; allow for minimum of two attendees per training session.
   1. Include applicable portion of O&M manuals.
   2. Include copies of all hand-outs that are not included in O&M manuals.

1.3 QUALITY ASSURANCE

A. Instructor Qualifications: Familiar with design, operation, maintenance and troubleshooting of the relevant products and systems.
   1. Provide as instructors the most qualified trainer of those contractors and/or installers who actually supplied and installed the systems and equipment.
   2. Where a single person is not familiar with all aspects, provide specialists with necessary qualifications.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 TRAINING - GENERAL

A. Review of Facility Policy on Operation and Maintenance Data: During training discuss:
   1. The location of the O&M manuals and procedures for use and preservation; backup copies.
   2. Typical contents and organization of all manuals, including explanatory information, system narratives, and product specific information.
   3. Typical uses of the O&M manuals.
B. Product and System-Specific Training:
   1. Review the applicable O&M manuals.

2. For systems, provide an overview of system operation, design parameters and constraints, and operational strategies.
3. Review instructions for proper operation in all modes, including start-up, shut-down and emergency procedures, and for maintenance, including preventative maintenance.
4. Provide hands-on training on all operational modes possible and preventive maintenance.
5. Emphasize safe and proper operating requirements.
6. Discuss common troubleshooting problems and solutions.
7. Discuss any peculiarities of equipment installation or operation.
8. Discuss warranties and guarantees, including procedures necessary to avoid voiding coverage.
9. Review recommended tools and spare parts inventory suggestions of manufacturers.
10. Review spare parts and tools required to be furnished by Contractor.
11. Review spare parts suppliers and sources and procurement procedures.

C. Be prepared to answer questions raised by training attendees; if unable to answer during training session, provide written response within three days.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES
- A. Selective demolition of building elements for alteration purposes.

1.2 RELATED REQUIREMENTS
- A. Section 01 50 00 - Temporary Facilities and Controls: Security, protective barriers, and waste removal.
- B. Section 01 70 00 - Execution and Closeout Requirements: Project conditions; existing construction to remain; reinstallation of removed products.

1.3 DEFINITIONS
- A. Remove: Detach or dismantle items from existing construction and dispose of them off site, unless items are indicated to be salvaged or reinstalled.
- B. Remove and Salvage: Detach or dismantle items from existing construction in a manner to prevent damage. Clean, package, label and deliver salvaged items to Owner in ready-for-reuse condition.
- C. Remove and Reinstall: Detach or dismantle items from existing construction in a manner to prevent damage. Clean and prepare for reuse and reinstall where indicated.
- D. Existing to Remain: Designation for existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

1.4 REFERENCE STANDARDS
- A. 29 CFR 1926 - Safety and Health Regulations for Construction; Current Edition.
- B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2027.

1.5 QUALITY ASSURANCE
- A. Demolition Firm Qualifications: Company specializing in demolition work in significant buildings.
  1. Minimum of 10 years of documented experience.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.1 GENERAL PROCEDURES AND PROJECT CONDITIONS
- A. Comply with requirements in Section 01 70 00.
- B. Provide, erect, and maintain temporary barriers and security devices.
- C. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
  1. Conduct operations to minimize effects on and interference with adjacent occupied spaces and occupants.
- D. Do not begin removal until receipt of notification to proceed from Owner.
- E. Do not begin removal until built elements to be salvaged or relocated have been removed.
- F. Protect existing structure and other elements to remain in place and not removed.
  1. Provide bracing and shoring.
  2. Prevent movement or settlement of adjacent structures.
  3. Stop work immediately if adjacent structures appear to be in danger.
- G. Minimize production of dust due to demolition operations.
- H. Hazardous Materials:

1. If hazardous materials are discovered during removal operations, stop work and notify Owner; hazardous materials include regulated asbestos containing materials, lead, PCBs, and mercury.
2. Comply with 29 CFR 1926 and state and local regulations.

I. Perform demolition in a manner that maximizes salvage and recycling of materials.
1. Dismantle existing construction and separate materials.
2. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

3.2 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Existing construction and utilities indicated on drawings are based on casual field observation and existing record documents only.
1. Verify construction and utility arrangements are as indicated.
2. Report discrepancies to Architect before disturbing existing installation.
3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.

B. Separate areas in which demolition is being conducted from areas that remain occupied.
1. Provide, erect, and maintain temporary padded, sound and dustproof partitions of construction specified in Section 01 50 00 and in locations indicated on drawings.
2. Partitions must protect underlying existing construction to remain during construction activities.
a. Pay particular attention to murals and bas-relief sculpture panel, both in Rotunda, these are to be protected by Owner.

C. Remove existing work as indicated and required to accomplish new work.
1. Remove damaged wood, corroded metals, and deteriorated masonry and concrete; replace with new construction indicated.
2. Remove items indicated on drawings.

D. Services including, but not limited to, HVAC, Plumbing, Fire Protection, Electrical, Telecommunications, and life safety devices: Remove existing systems and equipment as indicated.
1. Maintain existing active systems to remain in operation, and maintain access to equipment and operational components.
2. 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.
3. Verify that abandoned services serve only abandoned facilities before removal.
4. Remove abandoned pipe, ducts, conduits, and equipment, related systems in attic space above and basement spaces below work zone. Remove back to source of supply where possible, otherwise cap stub and tag with identification.

E. Protect existing work to remain.
1. Prevent movement of structure. Provide shoring and bracing as required.
2. Perform cutting to accomplish removal work neatly and as specified for cutting new work.
3. Repair adjacent construction and finishes damaged during removal work.
4. Patch to match new work.

3.3 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.
B. Leave site in clean condition, ready for subsequent work.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Repair of damaged bronze radiator grilles.
B. Restoration cleaning and refinishing of bronze radiator grilles.
C. Stripping and repainting of stamped steel radiator grilles.

1.2 RELATED REQUIREMENTS

A. Section 01 35 91 - Period Treatment Procedures: For general historic preservation project requirements.
B. See Material Condition drawings.

1.3 DEFINITIONS

A. Filler: Product to strengthen loose or deteriorated metal.
B. In situ: Repair procedure in which metal elements remain in place and are restored without removal from the system they are a part of.
C. New Elements: New, nonhistoric materials added to metal structures to aid in resistance to structural loads or resist water infiltration.
D. Patch: Use of substitute repair materials to treat damaged or deteriorated metal.
E. Patina: Color of the surface of metal caused by natural weathering or application of chemicals.

1.4 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; Current Edition.
B. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2019.
C. ASTM B36/B36M - Standard Specification for Brass Plate, Sheet, Strip, and Rolled Bar; 2023.
D. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings; 2017 (Reapproved 2025).
E. ASTM B135/B135M - Standard Specification for Seamless Brass Tube; 2026.
F. ASTM B138/B138M - Standard Specification for Manganese Bronze Rod, Bar, and Shapes; 2011 (Reapproved 2024).
G. ASTM B248 - Standard Specification for General Requirements for Wrought Copper and Copper-Alloy Plate, Sheet, Strip, and Rolled Bar; 2022.
H. AWS A5.7/A5.7M - Specification for Copper and Copper-Alloy Bare Welding Rods and Electrodes; 2026.
I. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025, with Amendment (2026).

1.5 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week prior to commencing work of this section.
    1. Require attendance of parties directly affecting work of this section.
    2. Review installation conditions, procedures, and coordination with related work.

1.6 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
B. Restoration Schedule: Detailed description of areas to be restored including assessment of problem areas proposed procedures. Include the following:
    1. Description of existing metal element failures that require repair prior to refinishing of surfaces.
    2. Photographic documentation of areas to be restored, prior to restoration work.

C. Product data.
D. Shop Drawings: Indicate extent of restoration work, and details of connections and anchors for metal elements.

1.7 QUALITY ASSURANCE
A. Conservation Treatment Quality Control Plan: Prior to commencing work of this section, receive written approval of plan of proposed metal restoration and cleaning work. Include the following:
1. Description of methods of dust and odor containment.
2. Description of methods of protecting surrounding construction.
3. Description of sequencing, work procedures, materials, and tools proposed for each type of conservation treatment.
4. Description of methods for deconstruction of individual metal items and tools and methods for cleaning for reuse.
5. Description of methods and approach for assuring repair materials match and are compatible with historic materials.
B. Restorer Qualifications: Company specializing in period metal restoration with minimum five years of documented experience.

1.8 MOCK-UPS
A. See Section 01 40 00 - Quality Requirements for additional requirements.
B. Perform offsite repair, cleaning and refinishing/repainting mockup for one (1) example of each type of radiator grille. See Material Condition drawings for grille types and quantities.
C. Review grille selection for mockups with Architect prior to any dis-assembly of in-place exisiting grilles.
D. Approved restoration of mock-up grilles areas may remain and become the quality standard for work of this section.

1.9 DELIVERY, STORAGE, AND HANDLING
A. Provide protective packing for each removed grille scheduled for restoration, both prior to shipping to and from metal restoration facility.
B. Protect grilles from abrasion and water damage.

PART 2 PRODUCTS

2.1 METAL MATERIALS FOR REPLICATION OR REPRODUCTIONS
A. Steel Components:
1. Sections, Shapes, Plate, and Bar: ASTM A36/A36M.
2. Ungalvanized Steel Sheet: Hot- or cold-rolled, except use cold-rolled where finished work will be exposed to view.
a. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Designation CS (commercial steel).
b. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Designation CS (commercial steel).
B. Bronze Components: ASTM B138/B138M.
1. Concealed: Alloy UNS C28000 muntz metal; color similar to alloy USN C38500.
2. Exposed: Architectural extruded bronze; color similar to alloy 280.
3. Bronze Sheet: ASTM B36/B36M, UNS No. C28000 (muntz metal, 60 percent copper).
4. Bronze Finish: Match restored existing finish.
5. Protective Coating: Thermoset clear enamel or acrylic.

2.2 METAL-FILLED EPOXY PATCHING MATERIALS

A. Bronze-Filled Putty: Two-component, resin and hardener; 100 percent solids, for patching, bonding, and resurfacing.
   1. Tensile Strength at 7 Days: 2,400 psi, minimum.
   2. Flexural Strength at 7 Days: 4,300 psi, minimum.
   3. Compressive Strength at 7 Days: 4,000 psi, minimum.
B. Steel-Filled Putty: Two-component, resin and hardener; 100 percent solids, for patching, bonding, and resurfacing.
   1. Tensile Strength at 7 Days: 3,100 psi, minimum.
   2. Flexural Strength at 7 Days: 5,500 psi, minimum.
   3. Compressive Strength at 7 Days: 8.800 psi, minimum.
C. Steel-Filled Epoxy Liquid: Two component, resin and hardener; 100 percent solids, for patching, bonding, and casting.
   1. formulated for patching, bonding, and casting.
      a. Tensile Strength at 7 Days: 3,500 psi, minimum.
      b. Flexural Strength at 7 Days: 5,000 psi, minimum.
      c. Compressive Strength at 7 Days: 7,700 psi, minimum.

2.3 BRAZING MATERIALS

A. Brazing Rods: Proprietary alloy rods with integral flux, for brazing repairs of bronze, nonstructural elements; comply with AWS A5.7/A5.7M.
   1. Tensile Strength: 102,000 psi.
   2. Bonding Temperature: 1,400 degrees F.
   3. Elongation: 30 percent.
   4. Brinell Hardness: HB 92.

2.4 BONDING ADHESIVES

A. General: For repairing and bonding metal.
B. Epoxy Adhesive: Two-component, exterior grade, tintable adhesive with gel viscosity.
   1. Cured Properties:
      a. Tensile Strength: 2,044 psi at 7 days, tested in accordance with ASTM D638.
      b. Compressive Strength: 8,182 psi at 7 days, tested in accordance with ASTM D695.
      c. Flexural Strength: 9,896 psi at 7 days, tested in accordance with ASTM D790.

2.5 SEALANTS

A. Joint Sealer, Interior: Nonsag, paintable, nonstaining latex sealant complying with ASTM C834; of type and grade required to seal joints in metal element, and with a VOC content of not more than 250 g/L, calculated in accordance with 40 CFR 59, Subpart D - EPA Method 24.
B. See Section 07 92 00 - Joint Sealants

2.6 CLEANING MATERIALS

A. Statuary Bronze Cleaning and Oiling: Use combination of materials to remove dirt, and, if indicated, dissolve existing lacquer. Apply protective coating of oil.
B. Cleaning Agent: Detergent type.
C. Soap: Mild soap with approximately 8.0 pH.
D. Corrosion Inhibitor/Cleaner for Copper Alloys: Solution of 1.41 ounces benzotriazole per one gallon of warm water.
E. Oil: Solution of 5 ounces of lemongrass essential oil mixed with one gallon of mineral oil.
F. Abrasive: Silicon carbide abrasive pads, standard commercially available pumice stone, or stainless steel wool.
   1. Do not use plain steel wool on bronze or other copper alloy materials.
G. Cloth: Clean cotton waste.

2.7 PAINT REMOVERS

A. See schedule for painted grilles.

B. Water-Based: Tentative formulated without methylene chloride or methanol, to remove multiple coats of oil-based, water-based, acrylic-based, epoxy-based, urethane-based, elastomeric, and lead-based paints.
   1. Formulation: Thixotropic paste or gel
   2. Acidic Type: 2.1 pH
   3. Surface Neutralization After Use: Not required

C. Solvent Based: Formulated without chlorinated solvents, acids, and caustics; to remove multiple coats of oil-based, water-based, acrylic-based, epoxy-based, urethane-based, elastomeric, and lead-based paints, and lacquers and enamels.
   1. Formulation: Thixotropic paste or gel
   2. Neutral Types: 8.02 pH
   3. Alkaline Types: 14.0 pH
   4. Applications: For use on exterior and interior surfaces

D. Methylene Chloride Based: Tentative to remove multiple coats of oil-based, water-based, acrylic-based, epoxy-based, urethane-based, elastomeric, and lead-based paints.
   1. Viscosity: Thixotropic paste or gel
   2. Temperature at Application: Coating and substrate temperature must be between 65 degrees F and 85 degrees F at time of application
   3. Surface Neutralization After Use: Not required
   4. Applications: For use on exterior and interior surfaces

2.8 LACQUER REMOVERS

A. Lacquer Remover: Mixture of 75 percent toluene, 24 percent acetone, and 1 percent butyl acetate.

B. Lacquer Remover: Premixed solvent normally used for thinning nitrocellulose lacquers.

2.9 REFINISHING MATERIALS

A. Patina: Aqueous solution of ammonium chloride prepared by the restorer.

B. Patina: Solution producing specific coloration effect using hot or cold application process.

C. Lacquer:
   1. Protective Coating for Copper Alloys: Thermoplastic acrylic air-dry coating.
      a. Viscosity: 30 to 60 sec. Z4 at 77 degrees F

2.10 ACCESSORY MATERIALS

A. Fasteners, General: Same basic metal and alloy as metal items being joined, unless indicated otherwise. Do not use incompatible metals that promote galvanic action.
   1. Nonferrous Metals Fastened to Carbon Steel or Iron Supports: Use Type 304 stainless steel fasteners.

B. Galvanic Separator for Dissimilar Metal Contact: Primer or with sealant or tape recommended by manufacturer for the purpose.

C. Bituminous Coating: Cold-applied asphalt mastic, noncorrosive compound free of asbestos, sulfur, and other deleterious impurities; 15 mil dry film thickness per coat.

PART 3 EXECUTION

3.1 PERIOD TREATMENT, GENERAL

A. All metal grille repairs, cleaning and refinishing are to be performed at an offsite facility.
   1. Carefully remove grilles from in situ location, document original location for reinstallation, retain all fasterners, provide protective packing and deliver to metal refinisher's shop for the work.

B. See Section 01 35 91 for special procedure requirements related to elements and features of historical significance and value.

3.2 PREPARATION

A. Protect surrounding elements from damage from grille removal and reinstallation procedures.
B. Remove and store removable items related to grille installation that are located in areas to be restored including, but not limited to, fittings, finish hardware, and accessories; reinstall upon completion of offsite restoration work.

3.3 REPAIR

A. General: Perform repairs in properly equipped fabrication facility in accordance with approved mock-up.
    1. Match repair method to condition of the element and applicability to the element's metal composition.
    2. Exercise care during dismantling of brittle elements.
    3. Complete the repair procedures by preparing surfaces for application of specified finishes.
B. Metal Stitching: Use along partial cracks in bronze elements, or to attach together existing or new sections of such an element.
    1. Use overlapping metal stitching pins and locks to bridge and seal cracks and align surfaces.
    2. Grind away protrusions.
C. Brazing: Use for reattachment of nonstructural elements.
    1. Use brazing rods as filler material for joining pieces together.
    2. Clean the area to be worked with a file, grinder, or wire brush.
    3. Heat the work surface until the work surface is hot enough to melt the rod.
    4. Scratch the rod all around the area to be repaired.
    5. Ensure rod has melted and fused down into the metal being repaired.
    6. Preparation for Refinishing: Use techniques appropriate to the repair, such as deburring, surface grinding, planishing, fine sanding, and polishing.
D. Patching: Use compatible patching compound on nonstructural cracks and surface area with small defects such as chips or where corroded portions of the metal have been removed.
E. Splicing: Splice in new or restored portions of bronze elements by in situ brazing.
F. Reinforcing: Supplement existing elements with braces, stiffeners, plates, to relieve the total carried load.
    1. Integrate reinforcing pieces into existing element by pinning or welding in a manner not adversely affecting aesthetic qualities.

3.4 GENERAL REQUIREMENTS FOR RESTORATION CLEANING

A. Perform grille cleaning offsite at metal repair facility.

3.5 COPPER ALLOY RESTORATION CLEANING

A. Preclean surfaces and remove large particles with nonferrous brush.
B. Clean with mild soap and soft cloth using fine abrasives such as diatomaceous earth products and solvents such as ordinary mineral spirits.
C. Clean persistent stains or badly corroded areas using a fine bronze-wool abrasive and mineral spirits or similar approved solvent.

3.6 REMOVAL OF EXISTING COATINGS

A. Remove existing coatings. Observe remover manufacturer's instructions. Leave metal in a clean, chemical-free, pH neutral condition free of residue.

B. Removal of Coatings: Use techniques least likely to damage bronze elements. Test effectiveness of proposed techniques on a small area prior to determining appropriateness of their use.
C. Remove old lacquer using lacquer remover applied with a cotton cloth wiped along the grain of the metal.
   1. Allow the remover to stand on the lacquer for several minutes.
   2. Wipe away remover with a cotton cloth or by flushing with water. Several applications of the stripper may be necessary in order to remove all traces of the lacquer from the metal.
   3. Follow the stripping operation with an application of metal cleaner on a soft cloth, rubbing along the grain of the metal.

3.7 CHEMICAL PATINATION FOR COPPER ALLOYS (TENTATIVE)
A. Provide sample for Architect's approval, prior to patinating all grilles.
B. Cleaning: Use a metal cleaner and degreaser recommended by patina chemicals manufacturer.
   1. Apply with brush, sponge, rag, or spray, as appropriate to element being refinished.
C. Patination: Use only approved materials and methods to achieve required coloration range.
   1. Apply with brush, sponge, rag, or spray, as appropriate to element being refinished.
   2. Use cold patina materials. Apply with ambient temperature within manufacturer's recommended range and not in direct sunlight.
   3. Use hot patina materials. Heat surface of metal to temperature recommended by manufacturer.
   4. Allow for chemical reaction for time period recommended by manufacturer.
   5. Reapply if color is not intense enough or does not provide acceptable match with existing patinated surfaces.

3.8 APPLICATION OF PROTECTIVE COATINGS FOR COPPER ALLOY
A. Prepare and clean substrates in accordance with coating manufacturer's instructions.
B. Remove cleaning product residue by washing surfaces at least twice with mineral spirits or similar approved solvent.
C. After removing cleaning product residue, wipe with inhibitor/cleaner solution.
D. Apply clear protective lacquer coating within four hours of cleaning where indicated.
   1. Use conventional spray equipment.
   2. Apply first coat in a thin mist. Allow to dry 30 minutes, minimum.
   3. Apply four additional wet coats, allow 30 minutes, minimum, drying time between each coat.
   4. Minimum Coating Dry Film Thickness: 40 mil, 0.040 inch.
   5. Final Drying Time: As recommended by coating manufacturer before the element can be touched or used.

3.9 REINSTALLATION OF REPAIRED ELEMENTS
A. Separate dissimilar metals to prevent corrosion by galvanic action by painting contact surfaces with primer or with sealant or tape recommended by manufacturer for the purpose.
B. Reinstall.

3.10 FINAL CLEANING
A. Remove stains resulting from the work of this section without delay.
B. Clean surrounding surfaces.

END OF SECTION

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. All labor and materials for metal fabrication items listed below and indicated on the Drawings:
   1. Steel framing and supports for mechanical and electrical equipment.
   2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
   3. Loose bearing and leveling plates.
   4. Steel lintels for interior doors.
   5. Steel reinforcements for architectural woodwork and casework.
   6. Steel supports for interior stonework and countertops.

1.2 RELATED REQUIREMENTS

A. Section 06 41 00 – Architectural Wood Casework: Steel support angles
B. Section 08 41 16 – Bronze Doors, Frames & Hardware: Steel channel at door head/transom.
C. Section 09 63 20 - Interior Cut Stone: Stone countertop supports.

1.3 REFERENCE STANDARDS

A. ASTM International:
   1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
   2. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
   3. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
   4. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
   5. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
   6. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
   7. ASTM A354 - Standard Specification for Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally Threaded Fasteners.
   8. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
   9. ASTM A501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
   10. ASTM A563 - Standard Specification for Carbon and Alloy Steel Nuts.
   11. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
   12. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
   13. ASTM A992/A992M - Standard Specification for Structural Steel Shapes.
   14. ASTM B26/B26M - Standard Specification for Aluminum-Alloy Sand Castings.
   15. ASTM B177 - Standard Guide for Chromium Electroplating on Steel for Engineering Use.
   16. ASTM B695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.
   17. ASTM F436 - Standard Specification for Hardened Steel Washers.
   18. ASTM F1554 - Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.

B. American Welding Society:
   1. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination.
   2. AWS D1.1 - Structural Welding Code - Steel.
C. National Ornamental & Miscellaneous Metals Association:
   1. NOMMA Guideline 1 - Joint Finishes.
D. SSPC: The Society for Protective Coatings:
   1. SSPC - Steel Structures Painting Manual.
   2. SSPC SP 1 - Solvent Cleaning.
   3. SSPC SP 10 - Near-White Blast Cleaning.
   4. SSPC Paint 15 - Steel Joist Shop Paint.
   5. SSPC Paint 20 - Zinc-Rich Primers (Type I - Inorganic and Type II - Organic).

1.4 SUBMITTALS

A. Product Data: For the following:
   1. Paint products.
   2. Grout.
B. Shop Drawings: Show fabrication and installation details for metal fabrications.
   1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
   2. Provide templates for anchors and bolts specified for installation under other Sections.
   3. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the Illinois licensed structural engineer responsible for their preparation.
C. Welding certificates: Welders shall be AWS certified to an appropriate classification to the welding task being performed.
D. Samples: For specified architectural products.
E. Delegated-Design Submittals: For the below listed metal fabrications, indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
   1. Door assembly structural lintels and anchors in surrounding masonry.

1.5 QUALITY ASSURANCE

A. Section 01 40 00 - Quality Requirements
B. Welding: Qualify procedures and personnel according to the following:
   1. AWS D1.1, "Structural Welding Code--Steel."
   2. AWS D1.3, "Structural Welding Code--Sheet Steel."
   3. NOMMA Guideline 1: “Joint Finishes”: Finish all exposed joints to “Finish #1”.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on Shop Drawings.
   1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
   2. Provide allowance for trimming and fitting at site.

1.7 COORDINATION

A. Section 01 30 00 – Administrative Requirements: Coordination.
B. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts,

anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
C. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
D. Rolled-Steel Floor Plate: ASTM A786/A786M, rolled from plate complying with ASTM A36/A36M or ASTM A283/A283M, Grade C or D.
E. Steel Tubing: ASTM A500/A500M, cold-formed steel tubing.
F. Steel Pipe: ASTM A53/A53M, Standard Weight (Schedule 40) unless otherwise indicated.
G. Size of Channels: As indicated.
H. Material: Galvanized steel, ASTM A653/A653M, structural steel, Grade 33, with G90 coating; 0.108-inch nominal thickness.
I. Material: Cold-rolled steel, ASTM A1008/A1008M, structural steel, Grade 33; 0.0966-inch minimum thickness; hot-dip galvanized after fabrication.

2.2 FERROUS METALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 25 percent.
B. Steel Plates, C-Shapes, Angles, and Bars: ASTM A 36/A 36M.
C. W, WT, and S Shapes: A572 Gr. 50 or A992.
D. Steel Tubing: ASTM A 500 Gr. B, cold-formed steel tubing.
E. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

2.3 FASTENERS

A. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A, with hex nuts, ASTM A 563 and, where indicated, flat washers, unless noted otherwise.
B. Anchor Bolts: ASTM F 1554, Grade 36.
    1. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated to be galvanized.
C. Eyebolts: ASTM A 489.
D. Machine Screws: ASME B18.6.
E. Lag Bolts: ASME B18.2.1.
F. Wood Screws: Flat head, ASME B18.6.1.
G. Plain Washers: Round, ASME B18.22.1.
H. Lock Washers: Helical, spring type, ASME B18.21.1.
I. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete.
    1. Material for Anchors in Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.

2.4 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79.
   1. Use primer with a VOC content of 420 g/L (3.5 lb/gal.) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
C. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
D. Form exposed work true to line and level with accurate angles and surfaces and straight edges.
E. Weld corners and seams continuously to comply with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
      a. Follow joint finish guidelines as specified in NOMMA “Guideline 1: Joint Finishes: Finish #1.
F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts, unless otherwise indicated. Locate joints where least conspicuous.
G. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
H. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
   1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
B. Fabricate units from steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.
C. Fabricate miscellaneous steel beams from continuous steel shapes of sizes indicated.
   1. Drill beams and plates for field-bolted connections where indicated.
D. Galvanize miscellaneous framing and supports where indicated.

E. Prime miscellaneous framing and supports unless noted otherwise excluding elements scheduled to receive sprayed fire protection or other special coatings not compatible with primer.

2.7 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for partitions at locations indicated. Weld adjoining members together to form a single unit where indicated.

2.8 STRUCTURAL SUPPORTS

A. Structural Supports: Steel sections, shape and size as indicated on Drawings required to support applied loads with maximum deflection of 1/360 of the span; prime paint, two coats after fabrication.

2.9 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
B. Finish metal fabrications after assembly.

2.10 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:
   1. ASTM A 123/A 123M, for galvanizing steel and iron products.
   2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.
B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
   1. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."
C. Shop Priming: Apply shop primer to uncoated surfaces of metal fabrications. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 – EXECUTION

3.1 WASTE MANAGEMENT

1. Coordinate with Owner's Building Superintendent for construction waste management and disposal.

3.2 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
   1. Follow joint finish guidelines as specified in NOMMA "Guideline 1: Joint Finishes: Finish #1.
B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
C. Field Welding: Not allowed.

3.3 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Anchor supports securely to and rigidly brace from building structure.
C. Support steel beams on solid grouted masonry, concrete, or steel pipe columns. Secure beams with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.
   1. Where grout space under bearing plates is indicated for beams supported on concrete or masonry, install as specified in “Installing Bearing and Leveling Plates” article.

3.4 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
   1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES
- A. Decorative metal grilles for radiator enclosures.
- B. Decorative metal grilles for wall and ceilings registers.
- C. Decorative bronze extrusions for fluted glass partitions on millwork.

1.2 RELATED REQUIREMENTS
- A. Section 06 41 00 - Architectural Wood Casework
- B. Section 23 37 00 - Air Outlets and Inlets.

1.3 REFERENCE STANDARDS
- A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2022.
- B. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.
- C. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.
- D. NAAMM AMP 500-06 - Metal Finishes Manual; 2006.
- E. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

1.4 SUBMITTALS
- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Submit manufacturer's product data, including description of materials, components, finishes, fabrication details, anchors, and accessories.
- C. Shop Drawings: Indicate elevations and sections, details of profile, dimensions, sizes, connection attachments, anchorage, size and type of fasteners, and accessories. Indicate anchor and joint locations, brazed connections, transitions, and terminations.
- D. Test Reports: Submit test reports from independent testing agency showing compliance with specified design and performance requirements.
- E. Maintenance Data: Manufacturer's instructions for care and cleaning.

1.5 QUALITY ASSURANCE
- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with not less than three years of documented experience.
- B. Templates: Supply installation templates, reinforcing, and required anchorage devices.

1.6 MOCK-UPS - CEILING SUPPLY GRILLES
- A. See Section 01 40 00 - Quality Requirements for additional requirements.
- B. Provide mock-up of assembly per MEP drawings.
- C. Locate where directed.

1.7 DELIVERY, STORAGE, AND HANDLING
- A. Deliver materials in factory-provided protective coverings and packaging.
- B. Protect materials against damage during transit, delivery, storage, and installation at site.
- C. Inspect materials for damage upon delivery. Replace damaged and unrepairable materials. Ensure replacement materials are indistinguishable from undamaged parts and finishes.
- D. Prior to installation, store materials and components under cover in a dry location.

PART 2 PRODUCTS

2.1 DECORATIVE METAL UNITS

A. Decorative Bronze Trim:
   1. U-Shaped Glazing Frame: Bronze Channel by Julius Blum & Co., 3/4" wide, 3/8" deep, 1/8" thick. Set with clear structural silicone adhesive on glass. Miter and weld corners.
   2. Glass Stops: Bronze Trim #6130 by Julius Blum & Co. Fasten with countersunk, slotted, flat-head bronze #6 screws every 12" O.C., screw length: 1".
   3. Profile: As indicated on drawings.

B. Radiator enclosure grilles:
   1. Base Metal/Finish: Bronze with antique bronze finish to match Architect's sample.
   2. Pattern: As indicated on drawings.
   3. Mounting: Screwholes and fasteners for attachment.
   4. Size: 50.75" x 8", 0.080" thick.
   5. Quantity: 8
   6. Manufacturer/Quote: Kees Inc., Quote# QN-26673

C. Ceiling grilles Reading Room:
   1. Base Metal/Finish: Shop finished with 2-part polyurethane paint to match Sherwin Williams SW7516 "Kestrel White", semi-gloss.
   2. Pattern: As indicated on drawings.
   3. Mounting: Screwholes and fasteners for attachment.
   4. Size: 48" x 17", 0.080" thick.
   5. Quantity: 3
   6. Manufacturer/Quote: Kees Inc., Quote# QN-26673

D. Ceiling grilles Adult Services:
   1. Base Metal/Finish: Shop finished with 2-part polyurethane paint to match Sherwin Williams SW7676 "Paper Lantern", semi-gloss.
   2. Pattern: As indicated on drawings.
   3. Mounting: Screwholes and fasteners for attachment.
   4. Size: 48" x 17", 0.080" thick.
   5. Quantity: 3
   6. Manufacturer/Quote: Kees Inc., Quote# QN-26673

E. Wall grilles Reference Annex:
   1. Base Metal/Finish: Shop finished with 2-part polyurethane paint to match Sherwin Williams SW6371 "Vanillin", semi-gloss.
   2. Pattern: As indicated on drawings.
   3. Mounting: Screwholes and fasteners for attachment.
   4. Size: 17.5" x 19.5", 14-gauge thick.
   5. Quantity: 2
   6. Manufacturer/Quote: Kees Inc., Quote# QN-26673

F. Metal angle at Archer Relief:
   1. L-shaped metal angle: Aluminum extrusion by Julius Blum & Co., 2" wide, 2" deep, 1/8" thick. Length as required.
   2. Mounting: Countersunk screws as required. Shop painted to match Sherwin Williams SW7563 (Restful White), satin sheen.

2.2 MATERIALS

A. General: Provide sheet metal without pitting, seam marks, roller marks, stains, discolorations, or other imperfections exposed to view on finished units.

B. Aluminum Components: ASTM B221 or ASTM B221M.
   1. Sheet Aluminum: ASTM B209/B209M, 5052 alloy, H32 or H22 temper.
   2. Sheet Thickness: See drawings.

C. Bronze Components: ASTM B138/B138M.
   1. Exposed: Architectural extruded bronze; color similar to alloy 280.

2. Sheet Thickness (radiator enclosure grilles): 12 gauge, 0.081 inch.
3. Julius Blum

2.3 FABRICATION

A. Fit and shop assemble items in largest practical sections for delivery to site.
B. Fabricate items with joints tightly fitted and secured.
C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
D. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
E. Joints and fittings: Factory- or shop-welded; joints and seams ground smooth.

2.4 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.
B. Maximum Offset Between Faces: Flush.
C. Maximum Misalignment of Adjacent Members: None.
D. Maximum Bow: 1/16 inch in 48 inches.

2.5 FINISHES

A. General: Comply with NAAMM AMP 500-06.
    1. Complete mechanical finishes before fabrication. After fabrication, finish joints, bends, abrasions, and surface blemishes to match sheet.
    2. Protect mechanical finishes on exposed surfaces from damage.
    3. Shop apply paint finishes to formed metal wall and ceiling grilles after fabrication.
    4. Appearance: Limit variations in appearance of adjacent pieces to one-half of range represented in approved samples. Noticeable variations in same piece are not acceptable. Install components within range of approved samples to minimize contrast.
B. Aluminum Finishes:
    1. High Performance Organic Coatings: AAMA 2604; multiple coats, thermally cured fluoropolymer system.
    2. Color: As selected by Architect from manufacturer's standard range.
    3. Touch-Up Materials: As recommended by coating manufacturer for field application.
C. Bronze Finish: To match Architect's approved sample.
    1. Protective Coating: Acrylic-based coating, clear lacquer.

2.6 ACCESSORIES

A. Anchors and Fasteners: Provide anchors, fasteners, and other attachment devices required to attach to structure. Ensure attachment devices are of same material as components unless indicated otherwise.
    1. Stainless Steel Fasteners: Type 304 , for wall and ceiling grilles. Paint to match grilles.
    2. Bronze Fasteners: For radiator enclosure grilles. See drawings.
    3. Exposed Fasteners: Flush countersunk screws.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate and site conditions are acceptable and ready to receive work.
B. Verify field dimensions of locations and areas to receive work.
C. Notify Architect immediately of conditions that would prevent satisfactory installation.
D. Do not proceed with work until detrimental conditions have been corrected.

3.2 PREPARATION

A. Protect existing work.
B. Clean surfaces to receive units. Remove materials and substances detrimental to installation.

3.3 INSTALLATION

A. Comply with manufacturer's drawings and written instructions.
B. Install components plumb and level, accurately fitted, free from distortion or defects, and with tight joints, except where necessary for expansion.
C. Anchor securely to structure.
D. Isolate dissimilar materials with bituminous coating, bushings, grommets, or washers to prevent electrolytic corrosion.

3.4 CLEANING

A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.
B. Remove protective film from exposed metal surfaces.
C. Metal: Clean exposed metal finishes with potable water and mild detergent, in accordance with manufacturer recommendations; do not use abrasive materials or chemicals, detergents, or other substances that may damage the material or finish.

3.5 PROTECTION

A. Protect installed components and finishes from damage after installation.
B. Repair damage to exposed finishes to be indistinguishable from undamaged areas.
C. If damage to finishes and components cannot be repaired to be indistinguishable from undamaged finishes and components, replace damaged items.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES
- A. Removal of existing wood finishes and refinishing.
- B. Repair and/or replacement of damaged wood components.

1.2 RELATED REQUIREMENTS
- A. Section 01 35 91 - Period Treatment Procedures
- B. Section 01 50 00 - Temporary Facilities and Controls
- C. Section 01 57 20 - Dust and Noise Control Procedures
- D. Section 06 41 00 - Architectural Wood Casework

1.3 DEFINITIONS
- A. Consolidant: Chemical product to strengthen loose or deteriorated wood.
- B. Dutchman: Repair method in which deteriorated wood component is removed in part and replaced with salvaged, harvested, or new wood.
- C. In situ: Repair procedure in which wood elements and components remain in place and are repaired without removal from the system they are a part of.
- D. New Elements: New, nonhistoric materials added to wood structures to aid in resistance to structural loads or water infiltration.
- E. Patch: Use of substitute repair materials to treat damaged or deteriorated components in situ.
- F. Surface Treatment: Application of traditional materials or contemporary chemical products to the surface of wood components to provide protection and reduce water infiltration.

1.4 REFERENCE STANDARDS
- A. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials; 2025.
- B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).
- C. AWPA U1 - Use Category System: User Specification for Treated Wood; 2025.

1.5 ADMINISTRATIVE REQUIREMENTS
- A. Preinstallation Meeting: Convene one week prior to commencing work of this section.
  1. Require attendance of parties directly affecting work of this section.
  2. Review installation conditions, procedures, and coordination with related work.

1.6 SUBMITTALS
- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on cleaning solutions.
- C. Shop Drawings: Indicate details of replacement units. Detail temporary or permanent support.
- D. Samples: Submit four 1 foot by 1 foot samples of replacement panel and 2 foot minimum length for standing and running trim to show matching color, texture, and finish.
- E. Manufacturer's Instructions: For cleaning materials, indicate special procedures.
- F. Conservation treatment quality control plan.
- G. Restorer's qualification statement.
- H. 2 x 3 foot square panels showing each:
  1. In-situ stripping of existing oak wall paneling
  2. In-situ refinishing of existing oak paneling.

1.7 QUALITY ASSURANCE

A. Conservation Treatment Quality Control Plan: Prior to commencing work of this section, receive written approval of plan of proposed wood restoration work. Include the following:
   1. Description of methods of dust containment.
   2. Description of methods of protecting surrounding construction.
   3. Description of sequencing, work procedures, materials, and tools proposed for each type of conservation treatment.
   4. Survey of original wall layout indicating existing conditions and identifying areas for repair or replacement.
      a. See drawings for areas of replacement and patching.
   5. Description of methods for shoring and providing a safe working environment.
   6. Description of methods for select deconstruction of individual wood components and methods for cleaning these for reuse.
   7. Description of methods and approach for assuring repair material matching and compatibility with original materials.
   8. Description of deteriorated wood framing removal including equipment, approach, and methodology for reconstruction using replacement framing.
      a. See Main Entry door frame (Door #1).

B. Grading Agency: Certified by ALSC; www.alsc.org.

C. Restorer Qualifications: Company specializing in period wood restoration with minimum ten years of documented experience.
   1. Use experienced carpenters and furniture craftspersons who have demonstrated proficiency in properly operating tools on historic elements.
   2. Company to supply a list of five (5) projects of similar scope performed by the company on buildings listed on the National Register of Historic Places.

D. Conservation Treatment Quality Control Plan: Prior to commencing work of this section, receive written approval of plan of proposed restoration and cleaning work. Include the following:
   1. Description of methods of dust containment.
   2. Description of methods of protecting surrounding construction and architectural features.
   3. Description of sequencing, work procedures, materials, and tools proposed for each type of conservation treatment specified.
   4. Description of methods for scaffolding and providing a safe working environment.
   5. Description of methods and approach for matching materials and compatibility with original materials.
   6. Description of methods and approach to periodic and final cleaning of wood paneling and trim surfaces.

1.8 MOCK-UPS

A. See Section 01 40 00 - Quality Requirements for additional requirements.

B. Strip existing finish, repair and refinish existing plain sawn oak wall paneling as indicated on Drawings, including trim and wall openings.
   1. Repair Material:
      a. Dutchman: Provide dutchman repairs in two locations including one that is only cut and prepared for application. Indicate wood inserts and techniques. Do not proceed with other dutchman repairs until technique has been approved by Architect.
   2. Transparent Finish Removal: Test products and procedures for each type of removal on inconspicuous areas of existing coatings. Allow test areas to dry thoroughly after treatment. Obtain Architect's approval prior to retaining test areas for acceptable work results standards.

3. Surface Treatments: Provide 16 sq ft mock-up, minimum, for each type of surface treatment on each type of wood substrate to be treated. Indicate tools and procedures for water repellents and consolidants.
4. New Wood Elements: Install one of each type indicating installation method and finished appearance.

C. Locate mock-up areas where directed.
D. Approved restoration mock-up areas, including results of procedures employed, may remain and become the quality standard for work of this section.

1.9 DELIVERY, STORAGE, AND HANDLING
A. Store replacement wood components for interior elements in conditioned, indoor space.
B. General:

PART 2 PRODUCTS

2.1 REPLACEMENT FINISH CARPENTRY MATERIALS
A. Lumber Materials:
1. Hardwood Lumber: White oak species, plain sawn matching existing wall paneling and solid trim, maximum moisture content of 6 percent, of quality suitable for transparent finish.
a. Grading: In accordance with NHLA G-101 Grading Rules; www.nhla.com.
B. Quality Standard: Items fabricated in accordance with AWI/AWMAC/WI (AWS).
C. Surface Burning Characteristics: Provide materials having fire and smoke properties as required by authority having jurisdiction.
D. Interior Finish Solid Wood Items: Matching existing elements.
1. Species: White oak; plain sawn; Walnut (built-in bookcases); solid.
2. Moldings, Bases, Casings, and Miscellaneous Trim: Prepare for transparent finish.
3. Window Sills: Prepare for transparent finish.
4. Built-In Bookcases and Bookcase Interiors: Friend's Reading Room, Adult Services, Reference Annex.
a. Prepare for transparent finish.
E. Interior Flat Paneling: Matching existing wall paneling and solid board elements.
1. Species: White oak.
2. Cut: Plain sawn.
3. Panels: Veneer of full width of panel' match existing grain. .
4. Visible Edges and Reveals: As indicated on drawings.
5. Outside Corners: Matching existing as indicated on drawings.
6. Veneer Match: Friend's Reading Room and Adult Services Reference Room and Reference Annex Room.
a. Provide paneling and wood trim by same supplier.
b. Obtain veneer from the same flitch as selected by Architect.
c. Faces at Exposed Ends of Cabinets: Select veneer from same flitch and match adjacent paneling and cabinet fronts.
F. Exterior Bulletin Boards: Repair and refinish two (2) exterior bulletin boards, including woodwork, glass, and hardware.
1. Species: Confirm with Architect.

2.2 CLEANING MATERIALS
A. Cleaning Agent: Detergent type.
B. Cleaning Agent: Triton X-100, diluted per manufacturer's recommendations (for cleaning bookshelves).
C. Cleaning Agent After Sanding: Rubio Monocoat Raw Wood Cleaner.
D. Neutralizer After Paint Stripping: Dumond Citri-Lize pH Neutralizer.

2.3 VARNISH REMOVERS

A. Manufacturers:
   1. CITRISTRIP; Citristrip Paint & Varnish Stripping Gel.
   2. Dumond Chemicals, Inc.; Smartstrip Pro Professional Strength Paint Remover.

B. Water-Based: Formulated with phosphoric acid and benzenemethanol and intended for removal of multiple coats of oil-based, water-based, acrylic-based, and lead-based paints.
   1. Formulation: Phosphoric Acid & Benzenemethanol gel.
   2. Acidic Type: 2.0 - 2.5 pH.
   3. Surface Neutralization after Use: Required.
   4. Products:
      a. Citristrip Paint & Varnish; varnish remover for white oak paneling, door and window casings, trim and sills, and Reference Annex bookcases.

C. Water-Based: Formulated with Benzyl Alcohol, Glycolic Acid and Calcined Kaolin and intended for removal of multiple coats of oil-based, water-based, acrylic-based, and lead-based paints.
   1. Formulation: Benzyl Alcohol & Glycolic Acid, Calcined Kaolin.
   2. Acidic Type: 2.1 - 3.0 pH
   3. Surface Neutralization after Use: Required.
   4. Products:
      a. Smart Strip Pro Paint Remover; varnish remover for walnut bookcases in Friend's Reading Room, Adult Services.

2.4 WOOD REPAIR MATERIALS

A. Source Limitations: Obtain compatible consolidants and patching and filling compounds from single manufacturer.

B. Manufacturers:
   1. TBD.

C. Consolidants:
   1. Water Based: Single-component, low-viscosity adhesive to penetrate and restore deteriorated wood.
      a. Primer for patching and filling compounds.

D. Patching and Filling Compounds:

2.5 BONDING ADHESIVES

A. General: Products for repairing and bonding wood and wood-based materials.

2.6 FIELD FINISHING MATERIALS

A. Manufacturer:
   1. Rubio Monocoat USA.
   2. Old Masters Craftsman Quality Finishes.
   3. General Finishes

B. Products:
   1. Rubio Monocoat Oil Plus 2C, White; White Oak surfaces.
   2. Rubio Monocoat Oil Plus 2C, color TBD; Walnut surfaces.
   3. Rubio Clear Maintenance Oil.
   4. Old Masters Gel Oil Stain in Natural.
   5. Old Masters Wiping Oil Stain in Natural.
   6. Rubio Monocoat - Universal Maintenance Oil in Pure (Clear); For clear sealant over Ceruse finish. For white oak paneling.
   7. Old Masters Oil Super Varnish Gloss and Satin or approved equivalent; Walnut surfaces.
   8. General Finishes Oil Arm-R Seal Gloss and Satin or approved equivalent; Walnut surfaces.

PART 3 EXECUTION

3.1 RESTORERS

A. Acceptable Restorers:

1. HistoricSurfaces
   1105 Maryland St.
   Grosse Pointe Park, MI 48230
   (708) 205-7164
   historicsurfaces.com
2. Evergreene Architectural Arts
   1033 South Blvd.
   Oak Park, IL 60302
   (708) 358-1642
   evergreene.com
3. Hester Painting & Decorating
   7340 Monticello Ave.
   Skokie, IL 60076
   (847) 677-5130
   hesterdecorating.com
4. Bernacki & Associates, Inc.
   46 Sherwood Terrace,
   Lake Bluff, IL 60044
   (312) 243-5669
   bernackiconservation.com
5. National Decorating Service
   2210 Camden Ct.
   Oakbrook, IL 60523
   (630) 571-8110
   nationaldecoratingservice.com
6. Ascher Brothers Co., Inc.
   3033 W Fletcher St.
   Chicago, IL 60618
   (312) 310-0337
   ascherbrothers.com

3.2 PERIOD TREATMENT, GENERAL

A. See Section 01 35 91 for special procedure requirements related to elements and features of historical significance and value.

3.3 EXAMINATION

A. Verify that surfaces to be cleaned, repaired and refinished are ready for work of this section.
B. Conduct wood finish (transparent) analysis report of existing finishes to determine appropriate materials and methods for new, matching finishes.

3.4 PREPARATION

A. Protect surrounding elements from damage that may result due to performance of restoration procedures.
B. Remove and store removable items located in areas to be restored including, but not limited to, fixtures, fittings, finish hardware, and accessories; reinstall upon completion.
C. Separate areas to be protected from restoration areas to prevent damage.
D. Mask or cover adjacent surfaces and permanent equipment. Secure coverings without nails or tapes that leave residue. Do not use impervious sheeting which produces condensation.

1. Use materials that withstand cleaning and restoration procedures.

E. When using liquid cleaning methods, install drainage devices to prevent runoff over adjacent surfaces unless those surfaces are impervious to damage from runoff.

F. Do not allow cleaning runoff to drain into sanitary or storm sewers.

G. Do not attach scaffolding, ladders, or working platforms to the building.

3.5 IN SITU RESTORATION

A. Do not mix or apply materials or products when the ambient temperature or humidity are outside range recommended by their manufacturers.

B. Schedule conservation treatments to avoid weather-related failures.

3.6 EXISTING TRANSPARENT FINISH REMOVAL

A. Work includes: White Oak paneling, windows, doors, window, door and portal trim, sills, casings and Reference Annex bookcases, including shelves.

B. Remove existing coatings to strip down to bare wood, free of previous coatings.

C. Removal with Hand Tools: Use tools to remove flaking, cracking, blistering, peeling, or otherwise deteriorated coatings without marring or otherwise damaging substrates.

1. Flat Areas: Use non-scratching hand scrapers.
2. Architectural Details: Use hand tools.
3. Do not use open-flame heat devices.

D. Removal with Chemical Products: Use products in accordance with manufacturer's instructions.

1. Vertical Surfaces: From the bottom up, apply undiluted removal product to dry surfaces in thickness recommended by manufacturer.
2. Allow product to dwell on existing surface for time period recommended by manufacturer or until existing coating dissolves, for a minimum of two (2) hours. Periodically agitate remover paste with a stiff bristle brush to improve penetration into coating.
3. If, after removal of the softened finish and stripper, remnants of the clear finish and/or dirt/staining remains embedded in the wood grain, apply a second application of stripper.
4. Remove the softened finish and stripper using non-scratching scrapers and approved cleaner.
5. Neutralize pH of stripped surfaces after using acidic-based or alkaline-based removers, as recommended by remover manufacturer.
    a. Brush apply neutralizer to treated surfaces in gentle scrubbing manner and allow to remain on surface for time period recommended by manufacturer.
    b. Rinse treated area thoroughly. Remove traces of paste residue and solubilized coating.
    c. Test surfaces with pH paper, pens or indicator solutions to verify neutralization. Repeat applications and testing until surfaces test between pH 5.0 and pH 9.0.
    d. Dry neutralized surface thoroughly. Before applying surface coatings, retest surfaces to confirm neutralization and prevent surface discoloration or failure of new coatings.
6. Remove all traces of chemicals and coating residue from substrate.

E. Leave surfaces in a clean, residue-free condition, ready for subsequent restoration procedures. Let treated wood surfaces dry for a minimum of twelve (12) hours. Verify wood is thoroughly dry before sanding.

F. Dried wood surfaces to be sanded with progressively finer sandpaper to make wood surfaces uniform. Sand progressively using 80, 120 and 180 grit sandpaper. Vacuum surfaces and wipe down any dust.

G. Once sanding is completed, clean wood surfaces with Rubio Wood Cleaner for Raw Wood, applied onto a soft cotton cloth. Remove any fine residue with a tack cloth.

H. Dispose of waste products and residue in accordance with applicable laws and regulations.

3.7 WOOD RE-FINISHING - OAK

A. Work includes White Oak paneling, windows, doors, window, door, and portal trim, sills, casings and Reference Annex bookcases, including shelves.
B. After completion of stripping, sanding, cleaning and drying, apply a coating of Rubio Monocoat Oil Plus 2C finish. Oil should have the appropriate amount of accelerator added and mixed thoroughly. Apply the Oil Plus 2C with a polishing pad/applicator, rubbing it across the grain of the wood and in a circular motion, making sure the wax medium rests in the open grain and pores of the wood and is evenly applied.
C. Once the oil has set for 5 to 10 minutes, remove the excess oil from the face of the wood with a clean polishing cloth, being careful not to remove or 'rub' out the liming.
D. After the Ceruse mixture has dried and is uniform, apply Clear Rubio Maintenance Oil. The clear oil is to be applied with a soft applicator pad making sure that is an even and consistent coat.
E. Once the oil has been let to sit for 10 to 15 minutes, the surfaces should be wiped with a clean lint-free rag or microfiber cloth to remove any excess. It may be necessary to apply a second coat of Clear Oil to provide a uniform surface and sheen.

3.8 WOOD FINISHING - WALNUT

A. Work includes Walnut bookcases, including shelves.
B. After completion of stripping, sanding, cleaning and drying, stain the wood surfaces with Old Masters Brand oil gel stain in color selected by the Architect. The stain should be uniformly applied with a soft natural bristle brush. Allow the stain to penetrate for 15 minutes and wipe off excess with a soft, clean lint-free rag. Areas that are too light or uneven may require a second application of stain. The stain should be allowed to dry overnight or more prior to any finishing.
C. Brush apply two coats of Oil Varnish. The varnish shall be applied with a soft, natural bristle brush, that is uniform in coverage and free of runs, brush marks or heavy build-up. The first coat should be a Gloss finish.
D. Apply second coat of a mixture of Gloss and Satin made to match the sheen of a clear wax finish.

3.9 REPLACEMENT ELEMENT INSTALLATION

A. Install work in accordance with AWI/AWMAC/WI (AWS) Section 12, Historic Restoration Work, and other applicable requirements.
B. Match existing elements unless otherwise required for protection of wood materials from the weather and approved by Architect.
C. Maintain continuity of historic architectural fabric.
D. Rough Carpentry Elements:
    1. Set structural members level and plumb.
    2. Provide for erection loads, and temporary bracing to maintain structure safe, plumb, and in true alignment until completion of erection and installation of permanent bracing.
    3. Do not field cut or alter structural members without approval of Architect.
E. Finish Carpentry:
    1. Interior Elements:
        a. Do not begin installation until wood materials have been acclimated to interior conditions.
        b. Standing and Running Trim: Attach using finishing nails. Set finish nail heads just below the surface of trim.
            1) Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use overlay trim to conceal larger gaps.
            2) Attach using finishing nails. Set finish nail heads just below the surface of trim.
        c. Paneling: Fit replacement pieces to remaining elements.

1) Set and secure materials and components in place, plumb, and level, using concealed fasteners wherever possible.
2) Where necessary to cut and fit on site, scribe work to abut other components. Do not use overlay trim to conceal gaps.
3) Coordinate the installation of firestopping behind paneling.
4) Set exposed fasteners, fill with wood filler, and finish to match panel finish.
5) Touch up damaged finish to match original using materials provided by fabricator. Replace components that cannot be refinished like new.

2. Field Finishing: Prepare elements for field finishing.
   a. Preparation: On exposed portions of woodwork remove handling marks or effects of exposure to moisture by sanding exposed surfaces with appropriate grit sandpaper.
   b. Clean before applying sealer or finish.
   c. Concealed Surfaces: Prime period woodwork that may be exposed to moisture, such as elements adjacent to exterior concrete or masonry walls.
   d. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.
   e. Field Finishing: Finish woodwork to match appearance of adjacent, restored woodwork and approved field mockup.

3.10 REPAIR

A. General: Use nonferrous fasteners. Isolate dissimilar metals from each other.
B. Patching: For wood elements indicated on drawings.
   1. Mix patching compound components and colorants as recommended by manufacturer.
   2. Mask off areas to be kept free of compound.
   3. Apply with putty knife or similar implement into and over areas to be repaired.
   4. Sand, plane, and shape repair area after patch has set for time period recommended by manufacturer.
C. Dutchman Installation: For wood elements indicated on drawings.
   1. Items Requiring Transparent Finish: Use wood of the same species, grade, cut, color, and grain.
   2. Where indicated or appropriate, use boat- or diamond-shaped wood patches to minimize joint surfaces at 90 degrees to grain direction.
   3. Trim and square area of replacement.
   4. Check prepared dutchman piece for proper fit.
   5. Mix adhesive components as recommended by manufacturer.
   6. Spread adhesive thinly on both faces keeping adhesive away from edges to avoid squeezing out.
   7. Press dutchman into place.
   8. Remove excess adhesive at glue line.

END OF SECTION

PART 1 GENERAL

1.1 SECTIONS INCLUDES
- A. Fire-retardant-treated wood materials.
- B. Concealed wood blocking, nailers, and supports.

1.2 REFERENCE STANDARDS
- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026a.
- B. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C. PS 20 - American Softwood Lumber Standard; 2025.
- D. SPIB (GR) - Standard Grading Rules; 2021.
- E. UL (DIR) - Online Certifications Directory; Current Edition.
- F. WCLIB (GR) - WCLB Standard Grading Rules for West Coast & Imported Softwood Lumber No.18; 2024.
- G. WWPA G-5 - Western Lumber Grading Rules; 2025.

1.3 SUBMITTALS
- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data:
  1. Fire-retardant treatment.
  2. Field-applied preservative treatment product data and application instructions.

1.4 DELIVERY, STORAGE, AND HANDLING
- A. Cover wood products to protect against moisture. Support stacked products to prevent deformation and allow air circulation.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS
- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
  1. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org), and that provides grading service for species and grade specified. Provide lumber stamped with grade mark unless otherwise indicated.
  2. Lumber of other species or grades is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.

2.2 DIMENSION LUMBER
- A. Grading Agency: Southern Pine Inspection Bureau, Inc; SPIB (GR).
- B. Sizes: Nominal sizes as indicated on drawings, S4S.
- C. Moisture Content: S-dry or MC19.
- D. Stud Framing for sizes 2 by 2 through 2 by 6:
  1. Species: Any species allowed under referenced grading rules.
  2. Species: Douglas Fir-Larch, Douglas Fir, Southern Pine, or Hem-Fir.
  3. Grade: Select Structural.
- E. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:
  1. Lumber: S4S, No.2 or Standard Grade.
  2. Boards: Standard or No.3.

2.3 FIRE-RETARDANT TREATMENT (FRT)

A. Factory-treat wood members in accordance with AWPA U1 and use category indicated.
B. Fire-Retardant Treatment: Interior Type A, Use Category UCFA (LT), Low-Temperature (low hygroscopic).
   1. Treat blocking and other wood members concealed in noncombustible construction.
   2. Treat electrical and communications panel backer boards.
   3. Treat wood in locations indicated on drawings.
C. Fire-Retardant Treatment: Interior Type A, Use Category UCFA (HT), High Temperature.
   1. Treat blocking and other wood members concealed in noncombustible construction.
   2. Treat electrical and communications panel backer boards.
   3. Treat wood and plywood used in roof framing and attic spaces.
   4. Treat wood in locations indicated on drawings.
D. Kiln-dry after treatment (KDAT) to maximum moisture content of 19 percent for sawn material and 15 percent for plywood.
E. Fabrication of FRT Wood:
   1. Ripping or milling of boards, lumber, and timber after treatment is not permitted.
   2. Field cutting to length and drilling of holes in boards, lumber, and timber are permitted without additional treatment.
   3. Field cutting and drilling of holes in plywood are permitted.
F. Label or brand FRT wood with classification mark of UL (DIR) or ITS (DIR) or other approved inspection agency, the treatment plant, name of treatment, species of wood, flame spread and smoke-developed indexes, method of drying after treatment, and treating standard.

2.4 ACCESSORIES
A. Metal and Finish of Fasteners:
   1. Fire-Retardant-Treated Wood:
      a. Comply with manufacturer's recomendations.
      b. Nails, timber rivets, wood screws, and lag screws: Hot-dip galvanized steel complying with ASTM A153/A153M Class D.
      c. Staples: Type 304 stainless steel.
      d. Fasteners other than staples, nails, timber rivets, wood screws, and lag screws: Mechanically deposited zinc-coated steel, ASTM B695 Class 55 or better.
   2. Untreated Wood: Unfinished steel.
   3. Metal and Finish: Hot-dip galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.
   4. Anchors: Toggle bolt type for anchorage to hollow masonry.
B. Construction Adhesives: Adhesives complying with ASTM C557 or ASTM D3498.

PART 3 EXECUTION

3.1 INSTALLATION - GENERAL
A. Select material sizes to minimize waste.
B. Reuse scrap to greatest extent possible; clearly separate scrap for use on-site as accessory components, including shims, bracing, and blocking.
C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.2 BLOCKING, NAILERS, AND SUPPORTS
A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code to close concealed draft openings between floors and

between top story and roof and attic space; other material acceptable to code authorities may be used in lieu of solid wood blocking.

C. In metal stud walls, provide continuous blocking around door and window openings for anchorage of frames, securely attached to stud framing.

D. In walls, provide blocking attached to studs as backing and support for wall-mounted items unless item can be securely fastened to two or more studs or another method of support is explicitly indicated.

E. Where ceiling mounting is indicated, provide blocking and supplementary supports above ceiling unless another method of support is explicitly indicated.

F. Provide the following specific nonstructural framing and blocking:
   1. Cabinets and shelf supports.
   2. Wall paneling and trim.
   3. Joints of rigid wall coverings that occur between studs.

3.3 CLEANING

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

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

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

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wood casework with transparent finish
B. Wood casework with laminate cladding
C. New radiator covers/enclosures
D. New bulletin boards
E. Shop finishing
F. Cabinet and drawer hardware

1.2 RELATED REQUIREMENTS

A. Section 05 70 00 - Decorative Metals
B. Section 06 10 53 - Miscellaneous Rough Carpentry
C. Section 08 71 00 - Door Hardware
D. Section 09 22 16 - Non-Structural Metal Framing

1.3 ABBREVIATIONS AND ACRONYMS

A. AWI: Architectural Woodwork Institute
B. CCP: Certified Compliance Program
C. HPDL: High-pressure decorative laminate
D. HDF: High-density fiberboard
E. MCP: Monitored Compliance Program
F. MDF: Medium-density fiberboard
G. MDO: Medium-density overlay
H. PTB: Particleboard
I. QCP: Quality Certification Program

1.4 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.
B. ANSI A135.4 - Basic Hardboard; 2012 (Reaffirmed 2020).
C. ANSI A208.1 - American National Standard for Particleboard; 2022.
D. ANSI A208.2 - Medium Density Fiberboard (MDF) for Interior Applications; 2022.
E. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).
F. ANSI/AWI 0400 - Factory Finishing; 2022.
G. ANSI/AWI 0620 - Finish Carpentry/Installation; 2024.
H. ANSI/AWI 0641 - Architectural Wood Casework; 2019.
I. ASTM C1036 - Standard Specification for Flat Glass; 2025.
J. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2025.
K. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2024, with Editorial Revision (2025).
L. ASTM D1037 - Standard Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials; 2012 (Reapproved 2020).
M. AWI 100 - Submittals; 2018.
N. AWI 200 - Care and Storage; 2018.
O. AWI 300 - Materials; 2018.
P. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.
Q. BHMA A156.9 - Cabinet Hardware; 2020.
R. BHMA A156.11 - American National Standard for Cabinet Locks; 2024.

S. BHMA A156.18 - Standard for Materials and Finishes; 2020.
T. CARB (ATCM) - Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products; Current Edition.
U. GANA (GM) - GANA Glazing Manual; 2022.
V. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2024.
W. ISO 4586-2 - High-Pressure Decorative Laminates (HPL, HPDL) – Sheets Based on Thermosetting Resins (Usually Called Laminates) – Part 2: Determination of Properties; 2018.
X. ISO 4586-3 - High-Pressure Decorative Laminates (HPL, HPDL) – Sheets Based on Thermosetting Resins (Usually Called Laminates) – Part 3: Classification and Specifications for Laminates Less than 2 mm Thick and Intended for Bonding to Supporting Substrates; 2018.
Y. ISO 4586-4 - High-Pressure Decorative Laminates (HPL, HPDL) – Sheets Based on Thermosetting Resins (Usually Called Laminates) – Part 4: Classification and Specifications for Compact Laminates of Thickness 2 mm and Greater; 2018.
Z. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.
AA. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.
BB. PS 1 - Structural Plywood; 2023.
CC. PS 20 - American Softwood Lumber Standard; 2025.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate schedule of climate-controlled rooms with schedule of storage of wood and wood-based materials requiring climate-controlled environments.
   2. Coordinate work of this section with installation of wood blocking, wood backing, wood furring, and other anchorage that provides casework backing and structural support.
   3. Coordinate work of this section with rough-in electrical that is integrally-related with casework.
   4. Coordinate farbrication of millwork items with avaliable access paths into the building for delivery accessibility.
B. Preinstallation Meeting: Convene preinstallation meeting not less than one week prior to completion of framing behind casework; require attendance of contractor, casework fabricator, and installer.
   1. Review locations of casework backing and structural support.
   2. Review backing attachment method to wall framing as indicated on drawings.

1.6 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
B. AWI QCP Program Submittal Requirements: Comply with AWI 100.
C. Product Data for Wood Casework for Transparent Finish: Submit manufacturer's published, product descriptive data.
   1. Panel Cores for Wood Veneer, HPDL, and TFL Panels: For each type, include thickness.
   2. Panel Substrates for Opaque Finishes: For each type, include type of core and density.
   3. HPDL Laminates: For each type, indicate description, thickness, and color.
   4. Veneer Tape Edgebanding: For each type, indicate material and thickness.
   5. Transparent Finish Systems: For each system, include manufacturer's name.
   6. Hardware: For each type of cabinet and drawer hardware.
   7. Locks: For each type of cabinet and drawer lock.
   8. Accessory Components: For each type of glass, grommet, and other accessories.

D. Shop Drawings:
   1. General: Each sheet sequentially numbered and dated.
      a. Sheet Size: 24 by 36 inches
      b. Contents: Indicate project name and project address.
   2. AWI QCP Program Shop Drawing Requirements:
      a. Comply with AWI 100 for shop drawing front matter documentation.
      b. Cover Sheet: Include phone numbers and email addresses of fabricator, finisher, and installer.
      c. Table of Contents: Include page number and title of each shop drawing.
      d. Aesthetic Grade: Identify specified grade and indicate compliance.
      e. Performance Duty Level: Identify specified duty level and indicate compliance.
      f. Identification of Materials: Include material lists or schedules.
      g. Reference Plans: Casework locations in relative context of building floor plans.
         1) Drawing Scale: 1/4 inch = 1 foot, minimum.
      h. Plans and Elevations: Plan and elevation views of each assembly type.
         1) Include rough opening dimensions and casework assembly dimensions.
         2) Drawing Scale: 3/4 inch = 1 foot, minimum.
      i. Detailed Sections: Dimensioned section views of each casework configuration.
         1) Include appropriate locations for casework wall anchorage.
         2) Drawing Scale: 1-1/2 inch = 1 foot, minimum.
      j. Details: Dimensioned casework assembly details with material thicknesses.
         1) Include wood veneer panels, laminate-clad panels, and panel cores.
         2) Drawing Scale: 3 inches = 1 foot, minimum.
      k. Details of Wood Veneer Leaves: Include dimensions and grain direction for each leaf.
         1) Drawing Scale: 3 inches = 1 foot, minimum.

E. Samples:
   1. AWI QCP Program Requirements for Samples: Comply with AWI 100.
   2. Samples, Solid Wood Stiles with Transparent Finish: For each species and cut, submit two samples, finished on exposed surfaces, representing expected range of color and grain; length: 6 inches, minimum.
   3. Samples, Wood Veneer Flitch Samples: For each wood veneer species and cut, submit flitch samples; indicate flitch number and gross square feet of veneer contained.
   4. Samples, Wood Veneer Panels: For each wood veneer species and cut, submit two finished samples, indicating specified species, cut, and finish; size: 8 by 8 inches, minimum; thickness: 3/4 inch.
   5. Samples, Solid Wood Edgebanding: For each species and cut of solid wood, submit two samples, finished three sides, representing range of color and grain to be provided; thickness as specified; length: 6 inches, minimum.
   6. Samples, Wood Veneer Edgebanding: For each species and cut of wood veneer, submit two samples, representing range of color and grain to be provided; length: 6 inches, minimum.
   7. Samples, Laminate-Clad Panels: For each laminate-clad type, submit two, laminate-clad sample panels; size: 8 by 8 inches; thickness: 3/4 inch.
   8. Samples, Hardware: For each hinge type, submit one sample, full-size, indicating specified finish.
   9. Samples, Hardware: For each adjustable shelf standard type, submit one sample, indicating specified finish; size: 6 inches.

F. Certificates, AWI: At end of AWI Quality Certification Program process, provide two samples indicating casework complies with specified performance requirements.

G. Fabricator's Instructions: Provide fabricator's installation instructions for shop-fabricated units.
H. AWI Test Reports: Provide report confirming casework conforms to Architectural Woodwork Institute specified performance requirements. Provide test reports confirming:
   1. Casework awarded duty level.
   2. Casework conforms to aesthetic requirements.
I. AWI Field Quality Control Inspection Reports: Provide report of inspection results first to architectural wood fabricator. After ten days, provided updated report to Architect, Owner, and Contractor.
J. Fabricator's qualification statement
K. Installer's qualification statement.
L. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: AWI QCP-licensed woodworking firm
B. Installer Qualifications: AWI QC-accredited installer
C. Fabricator/Installer Qualifications: Firm specializing in fabricating and installing products specified in this section with minimum five years of documented experience; with qualifications indicating ability to comply with requirements of this section.
D. Architectural Woodwork Institute (AWI) Quality Certification Program (QCP):
   1. Project Number: Upon contract, contracting fabricator will register work for QCP certification.
   2. Scope of Work:
      a. Shop drawing review provided by AWI QCP-appointed inspector.
      b. Casework fabrication provided by AWI QCP-licensed woodworking fabricator.
      c. Fabrication inspection performed by AWI QCP-appointed inspector.
      d. Installation inspection preformed by AWI QCP-appointed inspector.
   3. Provide AWI QCP labels on each casework elevation indicating casework fabrication and installation complies with requirements of specified aesthetic grades and performance levels.

1.8 MOCK-UPS

A. See Section 01 40 00 - Quality Requirements for additional mock-up requirements.
B. Provide one base cabinet mock-up with materials, finish, hardware, and accessories for specified cabinet finish type and for grade specified.
   1. Components: Provide one drawer, one door, and one shelf.
C. Locate where directed.
D. Mock-up may not remain as part of work.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in original packaging materials bearing product identification.
B. Store products prior to installation on flat, level, clean surfaces; elevate products above floors and protect from sunlight.
C. Store products in completed interior rooms.
D. Relative Humidity Conditions for Storing Wood and Wood-Based Core Products:
   1. Maintain relative humidity between 25 and 45 percent.
E. Store non-wood-based products under cover and elevated above grade.
   1. Protect from excessive moisture and standing water.
F. For products other than wood products, store and handle in accordance with manufacturer's documented instructions.
G. Handle materials and products to prevent damage to edges, ends, or surfaces.
H. Handle wood products with clean hands or gloves; protect from marks or damage.

1.10 FIELD CONDITIONS

A. Ambient Conditions for Acclimation, Installation, and Post-Installation of Wood-Based Products:
   1. Acclimation Period Prior to Installation: 72 hours minimum, inside installation environment.
   2. Temperature Conditions During Installation and Post-Installation: Maintain temperature between 60 degrees F and 90 degrees F.
   3. Relative Humidity Conditions During Acclimation, Installation, and Post-InstallationMaintain relative humidity between 25 and 45 percent.
   4. Maximum Sustained Time outside Specified Relative Humidity Range: 24 hours

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Furnish products provided by a single fabricator.
B. Single Source Responsibility: Provide and install this work from single fabricator.

2.2 ARCHITECTURAL WOOD CASEWORK

A. Casework Finish: Wood casework with transparent finish and laminate work surfaces.
B. Provide casework and casework components in sizes and profiles as indicated on drawings.
   1. Interior Clearances: Comply with specified performance requirements.
C. Adjustable Shelves, Number of Shelves Per Cabinet Unit:
   1. Base Cabinets: See drawings.
D. Scribed Fillers:
   1. Finish and Materials: Same materials and finish as exposed surfaces.
   2. Material thickness: Fabricator's option.
   3. Material Thickness: 1/4 inch actual, minimum.

2.3 PERFORMANCE REQUIREMENTS

A. Architectural Woodwork Institute (AWI) Performance Requirements:
   1. Comply with AWI 300, ANSI/AWI 0641, ANSI/AWI 0400, and ANSI/AWI 0620 as applicable for specified casework finish, aesthetic grade, and performance duty level.
      a. Aesthetic Grade: Premium
      b. Product Performance Duty Level: Duty Level 3
   2. Panel and Material Thicknesses: Provide panels and materials as required to meet specified performance duty level, subject to minimum thickness requirements of AWI 300 and ANSI/AWI 0641 and flatness requirements indicated below.
   3. Panel Flatness: Provide panels with maximum variation from flat in 12 inches as measured diagonally across panel.
      a. Premium Grade: Plus or minus 0.063 inch maximum.
   4. Cabinet Door Flatness:
      a. Comply with specified performance requirements.
      b. Provide cabinet doors with 1/8 inch maximum variation from flat.

2.4 WOOD CASEWORK WITH TRANSPARENT FINISH

A. Finishing Method:
   1. Shop-applied transparent finish to match architect approved sample.
B. Casework Construction:
   1. Frameless Cabinet and Door Interface: Flush overlay; see drawings.
   2. Face Frame Cabinet and Door Interface: Reveal overlay; see drawings.
   3. Door and Drawer Front Profile: Flush

4. Reveal Dimensions: Comply with specified performance requirements.

C. Wood Species for Exposed Exterior and Interior Surfaces:
   1. Hardwood Species and Cut: White oak; rift and quarter sawn.Refer to architectural drawings.
   2. Hardwood Species and Cut: Walnut; solid and burled. Refer to architectural drawings.
D. Premium Grade - Wood Casework with Transparent Finish:
   1. Exposed Exterior Surfaces: Panels to Receive Transparent Finish.
      a. Comply with specified performance requirements.
      b. Wood Veneer Panels:
         1) Face Veneers: Grade AA; well-matched for color and grain with adjacent wood veneer; compatible in color with solid wood panels.
   2. Exposed Interior Surfaces, Panels to Receive Transparent Finish:
      a. Comply with specified performance requirements.
      b. Wood Veneer Panels, Face Veneers: Grade A
         1) Species and Cut: Same species and cut and cut as exposed surfaces.
   3. Exposed Interior Surfaces, at Interior Faces of Doors and Drawer Fronts:
      a. Comply with specified performance requirements.
      b. Face Veneers: Grade A
         1) Species and Cut: Same species and cut as exposed surfaces.
   4. Semi-Exposed Surfaces, Panels and Wood Face Veneers:
      a. Comply with specified performance requirements.
      b. Wood Veneer Panels, Face Veneers: Grade A
         1) Species: Compatible species to exposed surfaces.
E. Wood Drawer Boxes - Wood Casework with Transparent Finish:
   1. Comply with specified performance requirements.
   2. Wood Veneer Panels, Face Veneers: Grade C, minimum.
   3. Wood Drawer Joinery:
      a. Dovetail joints
F. Exposed Exterior Surfaces, Matching of Veneer Leaves:
   1. Matching of Veneer Leaves: TBD
   2. Matching of Veneer Leaves Within Cabinet Unit Face: TBD
   3. Matching Between Doors, Drawers, and Adjacent Panels: TBD
   4. End Matching of Veneer Leaves: End match
G. Veneers from a Single Flitch:
   1. Provide veneers for each elevation from a single flitch.
H. Grain Direction of Exposed Surfaces:
   1. Fascia and Filler Panels: Vertical
   2. Tops: Side to side
   3. Soffits and Bottoms: Side to side
   4. Doors: Vertical
   5. Drawer Fronts: Vertical
   6. Knee Space Panels: Vertical
   7. Aprons: Vertical
   8. End Panels: Vertical
   9. Edgebanding: Parallel to long direction of edge.
I. Edgebanding Applications for Wood Casework with Transparent Finish:
   1. Edgebanding: Provide edgebanding on exposed edges.
      a. Comply with specified performance requirements.
      b. Provide edgebanding compatible for color and grain with exposed surfaces.
   2. Top Edges of Drawers and Wood Drawer Boxes:
      a. Comply with specified performance requirements.

b. Provide edgebanding.
c. Edges of Wood Veneer Core Panels: Provide, smooth, filled-and-sanded edges.
d. Match edgebanding with drawer side surfaces.

2.5 WOOD CASEWORK WITH LAMINATE CLAD WORK SURFACES

A. Premium Grade - Laminate-Clad Wood Casework:
1. Exposed Exterior Surfaces, Panels to Receive Laminate Cladding:
a. Comply with specified performance requirements.
b. HPDL Panels; ABET LAMINATI "Polaris-BK", color: #2902.
2. Exposed Interior Surfaces Except at Door and Drawer Front Surfaces:
a. Comply with specified performance requirements.
b. HPDL Panels: As specified.
3. Semi-Exposed Surfaces:
a. Comply with specified performance requirements.
b. HPDL Panels; Surface Finish: As specified.

2.6 SOLID WOOD COMPONENTS

A. Description: Components fabricated from solid wood; types inlcude flat panels.
B. Comply with specified performance requirements.
C. Solid Wood Type: White Oak; compatible in color with wood veneer.

2.7 WOOD VENEER PANELS

A. Description: Panels consisting of wood face veneers applied to cores; panel layup with face ply, back ply, and core of either single layer or odd number of inner plies, to produce balanced construction panel; comply with HPVA HP-1.
1. Panels subject to size limitations, minimum thickness requirements, and fabrication tolerances of specified aesthetic grade and performance duty level in accordance with AWI 300 and ANSI/AWI 0641.
B. Hardwood Face Veneers Intended to Receive Transparent Finish:
1. Species and Cut: As specified in this section with wood casework for transparent finish.
2. Face Veneer Grade: As specified in this section with wood casework intended for transparent finish; associated with applicable surface exposures and specified performance requirements.
3. Face Veneer Special Characteristics: In accordance with specified aesthetic grade.
C. Back: Comply with backer requirements of AWI 300.
D. Panel Cores:
1. Plywood Veneer Core
a. Plies: Varies, refer to architectural drawings.
b. Thickness: Varies, refer to architectural drawings.

2.8 WOOD AND WOOD-BASED MATERIALS

A. AWI 200 Wood Moisture Content Requirements:
1. Climate Zone 1: Between 4 and 9 percent
2. Climate Zone 2: Between 6 and 10 percent
3. Climate Zone 3: Between 8 and 13 percent
B. AWI 300 General Requirements for Wood:
1. Provide wood that is sound, free of decay, shake, pith, wane, and warp.
2. Provide wood in accordance with AWI 300.
C. Plywood: Comply with PS 1.
1. Structural I, Grade C-D, Exposure I
2. Performance Category: 23/32 minimum.

3. Performance Category: As indicated on drawings.

D. Wood Boards: Comply with PS 20.
   1. Thickness: 11/16 inch, actual, minimum.
   2. Thickness: As indicated on drawings.
E. Moisture-Resistant Wood: Where moisture-resistant wood is specified or indicated on drawings for cabinet base components, provide wood with thickness swelling of not more than 5 percent when tested in accordance with ASTM D1037.
F. Wood Anchoring Strips:
   1. Materials and Size: Fabricator's choice subject to requirements of ANSI/AWI 0641.
   2. Materials: Fabricator's option
   3. Materials: Plywood
   4. Materials: Wood boards
   5. Materials: As indicated on drawings.
   6. Size: As indicated on drawings.
   7. Application: As indicated on drawings.

2.9 CABINET AND DRAWER HARDWARE
A. See Drawings.

2.10 CASEWORK ACCESSORY COMPONENTS
A. Glass and Glazing Applications:
   1. Ribbed glass privacy screen for workstation table, as indicated on drawings.
      a. Exposed Edges and Corners: Ground and polished
      b. Ribbed glass panel is set in bronze frame.
      c. Laminated Safety Glass:
         1) Description: Two lites of flat glass of equal thickness bonded with one interlayer.
         2) ASTM C1036, Type I transparent flat; Class I clear.
         3) ANSI Z97.1, Type II; with interlayer complying with ASTM C1172 - Class A.
         4) 16 CFR 1201, Type II; with interlayer complying with ASTM C1172 - Category II.
         5) Interlayer: Ethylene Vinyl Acetate (EVA): 0.030 inch, minimum.
         6) Glass Ply Thickness: 1/4 inch nominal, minimum, each ply.
B. Bronze Trim and Mouldings: Extruded, TBD, see drawings.
   1. Type: As selected from manufacturer's standard range.
   2. U-Shaped Glazing Frame: Bronze Channel by Julius Blum & Co., 3/4" wide, 3/8" deep, 1/8" thick. Set with clear structural silicone adhesive on glass. Miter and weld corners.
   3. Glass Stops: Bronze Trim #6130 by Julius Blum & Co. Fasten with countersunk, slotted, flat-head bronze #6 screws every 12" O.C., screw length: 1".
C. Grommets: Plastic with matching slotted caps, round, see drawings.
   1. Applications: Where indicated on drawings.
   2. Shape: Round
   3. Inside Diameter: Varies; see drawings.
   4. Color: Varies; see drawings.
   5. Products:
      a. Doug Mockett & Company, Inc.: www.mockett.com.
D. Metal Hanging Systems:
   1. Description: TBD; cleated, z-shaped clips and rails, hanging systems.
   2. Material: TBD; extruded aluminum; alloy 6005-T6 tempered in accordance with ASTM B221.

2.11 FABRICATION

A. Shop-fabricate casework to dimensions, profiles, and details indicated on drawings.
B. Fabricate to maximum extents plausible, including doors, drawers, and hardware; fabricate units in sizes transportable through building openings.
C. Ease sharp edges of solid wood stiles and rails.
D. When necessary to cut and fit on site, provide materials with sufficient allowance for cutting.
E. Wood Casework with Laminate Cladding: See drawings. Apply laminates in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline.
F. Matching Wood Grain: Comply with requirements of quality standard for specified Grade and as follows:
G. Provide cutouts for electrical lines, outlet boxes, inserts, communication lines, computer equipment, and audio-visual equipment; verify locations of cutouts from on-site dimensions. Sand and seal cut edges.
H. Edgebanding: Apply where specified; do not use more than one piece for any single length.
I. Hardware: Install hardware in accordance with hardware manufacturer's written instructions; use fasteners supplied by hardware manufacturer.
J. Glazing: Install glass products with dry glazing method using soft, closed-cell gaskets in accordance with GANA (GM).
    1. Polish and grind exposed glass edges.
K. Fabrication Tolerances: Comply with specified performance requirements.

2.12 SHOP FINISHING

A. Surface Preparation: Comply with:
    1. ANSI/AWI 0400 for (Premium) aesthetic grade.
    2. Coating manufacturer's documented finishing instructions.
B. Shop Finishing: Shop finish architectural wood casework.
    1. Comply with ANSI/AWI 0400 for (Premium) aesthetic grade.
C. Grain Fillers: Apply to open-grained wood substrates; tint to match wood; work fillers into wood grain; wipe excess from surfaces.
D. Transparent Finish System:
    1. MPI (APSM) Gloss Level Measured at 60-Degree Angle:
        a. Gloss Level 5
    2. ANSI/AWI 0400 Finish System: TR-1 - Lacquer, Nitrocellulose
    3. Fabricator's choice within provisions of specified performance requirements.
    4. Stain: As selected by Architect

2.13 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for additional requirements.
B. Inspection Services: Provide AWI QCP fabrication inspection services.
    1. Inspect for compliance with contract documents; on subjects that contract documents are silent, inspect for compliance with specified AWI grade.
    2. Provide report of inspection results first to architectural woodwork fabricator. After ten days, provide updated report to Architect.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify casework and materials required for installation have been delivered, handled and stored as specified.
B. Verify structural support components for casework are installed as indicated on drawings.
C. Verify wood blocking is installed as indicated on drawings.
D. Verify location and sizes of rough-in electrical and data associated with work of this section.

E. Verify location and sizes of cutouts for appliances and special equipment to be mounted in or adjacent to casework.

3.2 PREPARATION

A. Acclimate casework to environments indicated for installation.
B. Verify door clearances for millwork delivery into final destination space.

3.3 INSTALLATION

A. Install and secure work of this section in accordance with specified performance requirements.
B. Install work of this section rigid, plumb, and level and in accordance with fabricator's documented instructions; secure casework as indicated on drawings.
   1. Align and secure adjoining cabinet units with fasteners in concealed locations.
C. Cabinet Anchorage Support Construction:
   1. See Section 06 10 53 for non-load-bearing wood stud framing, backing, and blocking providing backing for casework.
D. Install cabinet hardware in accordance with hardware manufacturer's documented instructions using hardware manufacturer's furnished fasteners.
E. Install scribe fillers, as indicated on shop drawings. Keep gaps between casework and adjacent walls.

3.4 TOLERANCES

A. Comply with specified performance requirements for tolerances.
B. Maximum Variation From Plumb: 1/8 inch in 96 inches.
C. Maximum Variation From Level: 1/8 inch in 96 inches.

3.5 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for additional requirements.
B. AWI QCP Inspection Services: Provide AWI QCP installation inspection services.
   1. Inspect for compliance with contract documents; on subjects contract documents are silent, inspect for compliance with specified AWI aesthetic grade.

3.6 ADJUSTING

A. Adjust hardware for smooth operation in accordance with hardware manufacturer's documented instructions.

3.7 CLEANING

A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.
B. Clean exposed surfaces of casework, shelving, hardware, and accessories.

3.8 PROTECTION

A. Protect installed casework from subsequent construction operations.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Firestopping of joints and penetrations in fire-resistance-rated and smoke-resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.2 RELATED REQUIREMENTS

A. Section 01 70 00 - Execution and Closeout Requirements: Cutting and patching.
B. Section 21 13 00 - Fire Suppression Sprinkler Systems
C. Section 26 05 33.13 - Conduit for Electrical Systems
D. Section 26 05 33.16 - Boxes for Electrical Systems
E. Section 27 10 00 - Structured Cabling
F. Section 28 46 00 - Fire Detection and Alarm

1.3 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 E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2026.
C. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2024.
D. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems; 2024.
E. ASTM E2174 - Standard Practice for On-Site Inspection of Installed Firestop Systems; 2024.
F. ITS (DIR) - Directory of Listed Products; Current Edition.
G. FM (AG) - FM Approval Guide; Current Edition.
H. UL 1479 - Standard for Fire Tests of Penetration Firestops; Current Edition, Including All Revisions.
I. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems; Current Edition, Including All Revisions.
J. UL (DIR) - Online Certifications Directory; Current Edition.
K. UL (FRD) - Fire Resistance Directory; Current Edition.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.
C. Product Data: Provide data on product characteristics, performance ratings, and limitations.
D. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.
E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
F. Manufacturer's qualification statement.

1.5 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated, ASTM E119, ASTM E814, and ASTM E1966.
    1. Listing in UL (FRD) or FM (AG) will be considered as constituting an acceptable test report.
B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years experience.

1.6 FIELD CONDITIONS

A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.
B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Firestopping Manufacturers:
   1. 3M Fire Protection Products: www.3m.com/firestop.
   2. A/D Fire Protection Systems Inc: www.adfire.com.
   3. Hilti, Inc: www.hilti.com.
   4. Specified Technologies Inc: www.stifirestop.com.
   5. Tremco Commercial Sealants & Waterproofing; TREMstop Acrylic: www.tremcosealants.com.

2.2 MATERIALS

A. Firestopping Materials: Foam, caulk, putty, or manufactured device.
B. Volatile Organic Compound (VOC) Content: Provide products having VOC content lower than that required by SCAQMD 1168.
C. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.
D. Fire Ratings: Refer to drawings for required ratings.

2.3 FIRESTOPPING ASSEMBLY REQUIREMENTS

A. Perimeter Fire Containment Firestopping: Use system that has been tested according to ASTM E2307 to have fire resistance F Rating equal to required fire rating of floor assembly.
   1. Movement: Provide systems that have been tested to show movement capability as indicated.
   2. Temperature Rise: Provide systems that have been tested to show T Rating as indicated.
   3. Air Leakage: Provide systems that have been tested to show L Rating as indicated.
B. Floor-to-Floor (FF), Floor-to-Wall (FW), Head-of-Wall (HW), and Wall-to-Wall (WW) Joints, Except Perimeter, Where Both Are Fire-Rated: Use system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.
   1. Movement: Provide systems that have been tested to show movement capability as indicated.
   2. Air Leakage: Provide systems that have been tested to show L Rating as indicated.
   3. Watertightness: Provide systems that have been tested to show W Rating as indicated.
   4. Listing by FM (AG), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.
C. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.
   1. Temperature Rise: Provide systems that have been tested to show T Rating as indicated.
   2. Air Leakage: Provide systems that have been tested to show L Rating as indicated.
   3. Watertightness: Provide systems that have been tested to show W Rating as indicated.
   4. Listing by FM (AG), UL (DIR), or UL (FRD) in their certification directories will be considered evidence of successful testing.

D. Acoustically Rated Firestopping: Provide system tested in accordance with ASTM E90 with STC rating of 50, minimum.

2.4 FIRESTOPPING FOR FLOOR-TO-FLOOR, FLOOR-TO-WALL, HEAD-OF-WALL, AND WALL-TO-WALL JOINTS

A. Gypsum Board Walls:
   1. Wall-to-Wall Joints That Have Not Been Tested For Movement Capabilities (Static-S):
      a. 2 Hour Construction: UL System WW-S-0063; Specified Technologies Inc. SpeedFlex TTG Track Top Gasket.
      b. 1 Hour Construction: UL System WW-S-0063; Specified Technologies Inc. SpeedFlex TTG Track Top Gasket.
   2. Wall-to-Wall Joints That Have Movement Capabilities (Dynamic-D):
      a. 2 Hour Construction: UL System WW-D-0067; Hilti CP 606 Flexible Firestop Sealant.
      b. 1 Hour Construction: UL System WW-D-0067; Hilti CP 606 Flexible Firestop Sealant.
   3. Head-of-Wall Joints at Underside of Flat Concrete:
      a. 2 Hour Construction: UL System HW-D-0044; Specified Technologies Inc. AS200 Elastomeric Spray.
      b. 2 Hour Construction: UL System HW-D-0079; Specified Technologies Inc. ES Elastomeric Firestop Sealant.
      c. 2 Hour Construction: UL System HW-D-1068; Hilti CFS-SP WB Firestop Joint Spray and CP 672.
      d. 2 Hour Construction: UL System HW-D-0016; Tremco, TREMstop Acrylic Firestop Sealant.
      e. 2 Hour Construction: UL System HW-D-0017; Tremco, TREMstop Acrylic Firestop Sealant.
      f. 2 Hour Construction: UL System HW-D-1072; Tremco, TREMstop Acrylic Firestop Sealant.
      g. 1 Hour Construction: UL System HW-D-0079; Specified Technologies Inc. ES Elastomeric Firestop Sealant.
      h. 1 Hour Construction: UL System HW-D-1068; Hilti CFS-SP WB Firestop Joint Spray and CP 672.
      i. 1 Hour Construction: UL System HW-D-0016; Tremco, TREMstop Acrylic Firestop Sealant.

2.5 FIRESTOPPING PENETRATIONS THROUGH CONCRETE AND CONCRETE MASONRY CONSTRUCTION

A. Penetrations Through Floors or Walls By:
   1. Multiple Penetrations in Large Openings:
      a. 2 Hour Construction: UL System C-AJ-8143; Hilti FS-ONE MAX Intumescent Firestop Sealant.
      b. 2 Hour Construction: UL System C-AJ-8055; Specified Technologies Inc. SSP Firestop Putty.
      c. 2 Hour Construction: UL System C-AJ-8093; Specified Technologies Inc. SSB Intumescent Firestop Pillows.
   2. Uninsulated Metallic Pipe, Conduit, and Tubing:
      a. 2 Hour Construction: UL System C-AJ-1090; Specified Technologies Inc. SSP Firestop Putty.
      b. 2 Hour Construction: UL System C-AJ-1198; Specified Technologies Inc. SIL Silicone Sealant.
      c. 2 Hour Construction: UL System C-AJ-1226; Hilti FS-ONE MAX Intumescent Firestop Sealant.

3. Uninsulated Non-Metallic Pipe, Conduit, and Tubing:
   a. 2 Hour Construction: UL System C-AJ-2167; Hilti FS-ONE MAX Intumescent Firestop Sealant.
   b. 2 Hour Construction: UL System C-AJ-2109; Hilti CP 643N/644 Firestop Collar.
   c. 2 Hour Construction: UL System C-AJ-2297; Specified Technologies Inc. SSC Collars.
   d. 2 Hour Construction: UL System C-AJ-2298; Specified Technologies Inc. LCC Intumescent Firestop Collars.
   e. 2 Hour Construction: UL System C-BJ-2021; Hilti CP 643N Firestop Collar.
4. Electrical Cables Not In Conduit:
   a. 2 Hour Construction: UL System C-AJ-3283; Hilti CP653 Speed Sleeve.
   b. 2 Hour Construction: UL System C-AJ-3283; Hilti CFS-SL SK Firestop Sleeve Kit.
   c. 2 Hour Construction: UL System C-AJ-3283; Hilti CFS-SL SK Firestop Sleeve Kit with Hilti CFS-SL GP Gangplate.
   d. 2 Hour Construction: UL System W-J-3198; Hilti CFS-SL RK Retrofit Sleeve Kit for Existing Cables.
   e. 2 Hour Construction: UL System W-J-3199; Hilti CFS-SL SK Firestop Sleeve Kit.
   f. 2 Hour Construction: UL System F-A-3085, F-A-3087, F-A-3088, W-J-3277, W-J-3278, W-J-3279, W-L-3481, W-L-3482, W-L-3483, and W-L-3484.; Hilti CFS-MSL L Modular Sleeve.
5. Insulated Pipes:
   a. 2 Hour Construction: UL System C-AJ-5048; Hilti FS-ONE MAX Intumescent Firestop Sealant, CP 606 Flexible Firestop Sealant, CP 601S Elastomeric Firestop Sealant, CP 604 Self-Leveling Firestop Sealant or CFS-S SIL GG Firestop Silicone Sealant Gun-Grade.
   b. 2 Hour Construction: UL System C-AJ-5087; Specified Technologies Inc. SSS Intumescent Firestop Sealant.
   c. 2 Hour Construction: UL System C-AJ-5091; Hilti FS-ONE IMAX Intumescent Firestop Sealant.
   d. 2 Hour Construction: UL System C-AJ-5138; Specified Technologies Inc. LCI Intumescent Firestop Sealant.

B. Penetrations Through Walls By:
1. Uninsulated Metallic Pipe, Conduit, and Tubing:
   a. 2 Hour Construction: UL System W-J-1067; Hilti FS-ONE MAX Intumescent Firestop Sealant.
   b. 1 Hour Construction: UL System W-J-1067; Hilti FS-ONE MAX Intumescent Firestop Sealant.
2. Electrical Cables Not In Conduit:
   a. 2 Hour Construction: UL System C-AJ-3357; HoldRite HydroFlame 100 Intumescent Firestop Sealant.
   b. 2 Hour Construction: UL System C-AJ-3095; Hilti FS-ONE MAX Intumescent Firestop Sealant.
   c. 2 Hour Construction: UL System C-AJ-3216; Hilti CFS-PL Firestop Plug.
   d. 2 Hour Construction: UL System W-J-3090; Specified Technologies Inc. SSP Firestop Putty.
3. Insulated Pipes:
   a. 2 Hour Construction: UL System C-AJ-5090; Hilti FS-ONE MAX Intumescent Firestop Sealant.
   b. 2 Hour Construction: UL System C-AJ-5091; Hilti FS-ONE MAX Intumescent Firestop Sealant.
   c. 1 Hour Construction: UL System C-AJ-5090; Hilti FS-ONE MAX Intumescent Firestop Sealant.

d. 1 Hour Construction: UL System C-AJ-5091; Hilti FS-ONE MAX Intumescent Firestop Sealant.

2.6 FIRESTOPPING PENETRATIONS THROUGH GYPSUM BOARD WALLS

A. Penetrations By:

1. Multiple Penetrations in Large Openings:
   a. 2 Hour Construction: UL System W-L-1408; Hilti FS-ONE MAX Intumescent Firestop Sealant.
   b. 2 Hour Construction: UL System W-L-8013; Hilti CFS-BL Firestop Block.
   c. 2 Hour Construction: UL System W-L-8025; Specified Technologies Inc. LCI Intumescent Firestop Sealant.
   d. 2 Hour Construction: UL System W-L-8050; Specified Technologies Inc. SSB Intumescent Firestop Pillows.
   e. 2 Hour Construction: UL System W-L-8071; Hilti FS-ONE MAX Intumescent Firestop Sealant.
   f. 2 Hour Construction: UL System W-L-8079; Hilti FS-ONE MAX Intumescent Firestop Sealant.
   g. 1 Hour Construction: UL System W-L-1408; Hilti FS-ONE MAX Intumescent Firestop Sealant.
   h. 1 Hour Construction: UL System W-L-8013; Hilti CFS-BL Firestop Block.
   i. 1 Hour Construction: UL System W-L-8025; Specified Technologies Inc. LCI Intumescent Firestop Sealant.
   j. 1 Hour Construction: UL System W-L-8050; Specified Technologies Inc. SSB Intumescent Firestop pillows.
   k. 1 Hour Construction: UL System W-L-8071; Hilti FS-ONE MAX Intumescent Firestop Sealant.
   l. 1 Hour Construction: UL System W-L-8079; Hilti FS-ONE MAX Intumescent Firestop Sealant.
2. Uninsulated Metallic Pipe, Conduit, and Tubing:
   a. 2 Hour Construction: UL System W-L-1033; Specified Technologies Inc. SIL Silicone Sealant.
   b. 2 Hour Construction: UL System W-L-1049; Specified Technologies Inc. SSS Intumescent Firestop Sealant.
   c. 2 Hour Construction: UL System W-L-1090; Specified Technologies Inc. LC Endothermic Firestop Sealant.
   d. 2 Hour Construction: UL System W-L-1054; Hilti FS-ONE MAX Intumescent Firestop Sealant.
   e. 2 Hour Construction: UL System W-L-1164; Hilti FS-ONE MAX Intumescent Firestop Sealant.
   f. 2 Hour Construction: UL System W-L-1222; Specified Technologies Inc. LCI Intumescent Firestop Sealant.
   g. 1 Hour Construction: UL System W-L-1049; Specified Technologies Inc. SSS Intumescent Firestop Sealant.
   h. 1 Hour Construction: UL System W-L-1054; Hilti FS-ONE MAX Intumescent Firestop Sealant.
   i. 1 Hour Construction: UL System W-L-1164; Hilti FS-ONE MAX Intumescent Firestop Sealant.
   j. 1 Hour Construction: UL System W-L-1222; Specified Technologies Inc. LCI Intumescent Firestop Sealant.
3. Uninsulated Non-Metallic Pipe, Conduit, and Tubing:
   a. 2 Hour Construction: UL System W-L-2128; Hilti FS-ONE MAX Intumescent Firestop Sealant.

b. 1 Hour Construction: UL System W-L-2128; Hilti FS-ONE MAX Intumescent Firestop Sealant.

4. Electrical Cables Not In Conduit:
   a. 2 Hour Construction: UL System W-L-3024; Specified Technologies Inc. SSP Firestop Putty.
   b. 2 Hour Construction: UL System W-L-3065; Hilti FS-ONE MAX Intumescent Firestop Sealant, CP 606 Flexible Firestop Sealant, CD 601S Elastomeric Firestop Sealant, or CP 618 Firestop Putty Stick.
   c. 2 Hour Construction: UL System W-L-3076; Specified Technologies Inc. SSS Intumescent Firestop Sealant.
   d. 2 Hour Construction: UL System W-L-3084; Specified Technologies Inc. SSB Intumescent Firestop Pillows.
   e. 2 Hour Construction: UL System W-L-3135; Specified Technologies Inc. SSP Firestop Putty.
   f. 2 Hour Construction: UL System W-L-3169; Specified Technologies Inc. LCI Intumescent Firestop Sealant.
   g. 2 Hour Construction: UL System W-L-3350; Specified Technologies Inc. LC Endothermic Firestop Sealant.
   h. 2 Hour Construction: UL System W-L-3357; Specified Technologies Inc. FP Intumescent Firestop Plug.
   i. 2 Hour Construction: UL System W-L-3369; Specified Technologies Inc. EZ Firestop Grommet.
   j. 2 Hour Construction: UL System W-L-3370; Specified Technologies Inc. EZ Firestop Grommet.
   k. 2 Hour Construction: UL System W-L-3374; Specified Technologies Inc. FP Intumescent Firestop Plug.
   l. 2 Hour Construction: UL System W-L-3378; Specified Technologies Inc. EZ Firestop Grommet.
   m. 2 Hour Construction: UL System W-L-3379; Specified Technologies Inc. EZ Firestop Grommet.
   n. 2 Hour Construction: UL System W-L-3393; Hilti CFS-SL RK Retrofit Sleeve Kit for Existing Cables.
   o. 2 Hour Construction: UL System W-L-3395; Hilti CFS-SL SK Firestop Sleeve Kit.
   p. 1 Hour Construction: UL System W-L-3024; Specified Technologies Inc. SSP Firestop Putty.
   q. 1 Hour Construction: UL System W-L-3065; Hilti FS-ONE MAX Intumescent Firestop Sealant, CP 606 Flexible Firestop Sealant, CD 601S Elastomeric Firestop Sealant, or CP 618 Firestop Putty Stick.
   r. 1 Hour Construction: UL System W-L-3076; Specified Technologies Inc. SSS Intumescent Firestop Sealant.
   s. 1 Hour Construction: UL System W-L-3084; Specified Technologies Inc. SSB Intumescent Firestop Pillows.
   t. 1 Hour Construction: UL System W-L-3135; Specified Technologies Inc. SSP Firestop Putty.
   u. 1 Hour Construction: UL System W-L-3169; Specified Technologies Inc. LCI Intumescent Firestop Sealant.
   v. 1 Hour Construction: UL System W-L-3357; Specified Technologies Inc. FP Intumescent Firestop Plug.
   w. 1 Hour Construction: UL System W-L-3369; Specified Technologies Inc. EZ Firestop Grommet.
   x. 1 Hour Construction: UL System W-L-3370; Specified Technologies Inc. EZ Firestop Grommet.
   y. 1 Hour Construction: UL System W-L-3374; Specified Technologies Inc. FP Intumescent Firestop Plug.

z. 1 Hour Construction: UL System W-L-3378; Specified Technologies Inc. EZ Firestop Grommet.
aa. 1 Hour Construction: UL System W-L-3379; Specified Technologies Inc. EZ Firestop Grommet.
bb. 1 Hour Construction: UL System W-L-3393; Hilti CFS-SL RK Retrofit Sleeve Kit for Existing Cables.

5. Insulated Pipes:
   a. 2 Hour Construction: UL System W-L-5014; Specified Technologies Inc. SSS Intumescent Firestop Sealant.
   b. 2 Hour Construction: UL System W-L-5028; Hilti FS-ONE MAX Intumescent Firestop Sealant.
   c. 2 Hour Construction: UL System W-L-5029; Hilti FS-ONE Intumescent Firestop Sealant.
   d. 2 Hour Construction: UL System W-L-5121; Specified Technologies Inc. LCI Intumescent Firestop Sealant.
   e. 1 Hour Construction: UL System W-L-5014; Specified Technologies Inc. SSS Intumescent Firestop Sealant.
   f. 1 Hour Construction: UL System W-L-5028; Hilti FS-ONE MAX Intumescent Firestop Sealant.
   g. 1 Hour Construction: UL System W-L-5029; Hilti FS-ONE Intumescent Firestop Sealant.
   h. 1 Hour Construction: UL System W-L-5121; Specified Technologies Inc. LCI Intumescent Firestop Sealant.

PART 3 EXECUTION

3.1 EXAMINATION
- A. Verify openings are ready to receive the work of this section.

3.2 PREPARATION
- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.
- B. Remove incompatible materials that could adversely affect bond.
- C. Install backing, damming, or filler materials to prevent liquid material from leakage.

3.3 INSTALLATION
- A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.
- B. Do not cover installed firestopping until inspected by authorities having jurisdiction.
- C. Install labeling required by code.

3.4 FIELD QUALITY CONTROL
- A. Repair or replace penetration firestopping and joints at locations where inspection results indicate firestopping or joints do not meet specified requirements.

3.5 CLEANING
- A. Clean adjacent surfaces of firestopping materials.

3.6 PROTECTION
- A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Nonsag gunnable joint sealants.
B. Joint backings and accessories.

1.2 REFERENCE STANDARDS

A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer; 2015 (Reapproved 2022).
B. ASTM C794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants; 2018 (Reapproved 2022).
C. ASTM C834 - Standard Specification for Latex Sealants; 2017 (Reapproved 2023).
D. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2024.
E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018 (Reapproved 2024).
F. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2025.
G. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2022.
H. ASTM C1311 - Standard Specification for Solvent Release Sealants; 2022.
I. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints; 2019 (Reapproved 2025).
J. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2026a.
K. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2026.
L. SCAQMD 1168 - Adhesive and Sealant Applications; 1989, with Amendment (2022).
M. UL 263 - Standard for Fire Tests of Building Construction and Materials; Current Edition, Including All Revisions.

1.3 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
B. Product Data: Submit manufacturer's technical datasheets for each product to be used; include 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, including substrates that could be stained by the sealant.
    5. Substrates for which use of primer is required.
    6. Installation instructions, including precautions, limitations, and recommended backing materials and tools.
C. Product Data for Accessory Products: Submit manufacturer's technical data sheet for each product to be used, including physical characteristics, installation instructions, and recommended tools.
D. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.
E. Manufacturer's qualification statement.
F. Executed warranty.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
B. Installer Qualifications: Company specializing in performing the work of this section and with at least of three years documented experience.
C. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.
    1. Adhesion Testing: In accordance with ASTM C794.
    2. Compatibility Testing: In accordance with ASTM C1087.
    3. Allow sufficient time for testing to avoid delaying the work.
    4. Report recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.
D. Installation Plan: Include schedule of sealed joints, including the following:
    1. Joint width indicated in Contract Documents.
    2. Joint depth indicated in Contract Documents; to face of backing material at centerline of joint.
    3. Method to be used to protect adjacent surfaces from sealant droppings and smears, with acknowledgment that some surfaces cannot be cleaned to like-new condition and therefore prevention is imperative.

1.5 WARRANTY
A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.
B. Manufacturer Warranty: Provide 2-year manufacturer warranty for installed sealants and accessories that fail to achieve a watertight seal, exhibit loss of adhesion or cohesion, or do not cure. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS
A. Nonsag Sealants:
    1. Dow: www.dow.com.
    2. Sika Corporation: usa.sika.com.
    3. Tremco Commercial Sealants & Waterproofing: www.tremcosealants.com.
    4. US Gypsum Corp.: www.usg.com.

2.2 JOINT SEALANT APPLICATIONS
A. Scope:
    1. Exterior Joints:
        a. Joints between door frame and existing wood surround.
        b. Joints between exterior wood casing and existing stone.
    2. Interior Joints:
        a. Do not seal through-penetrations that are also fire-rated assemblies; See Section 07 84 00 - Firestopping.
        b. Seal the following joints:
            1) Joints between door frames, other frames, and adjacent construction.
            2) In wall and ceiling assemblies, gaps at electrical outlets, wiring devices, piping and conduit penetrations, and other openings.
            3) In wall and ceiling assemblies, seal joints between wall assemblies and ceiling assemblies; between wall assemblies and other construction; between ceiling assemblies and other construction.

B. Exterior Joints: Use nonsag sealant, unless otherwise indicated.
    1. Paintable polyurethane sealant, where indicated.

2. Non-staining silicone, where indicated.

C. Interior Joints: Use acrylic sealant, unless otherwise indicated.
1. Seal all nonfire-rated penetrations and joints with acrylic sealant, where indicated.

2.3 JOINT SEALANTS - GENERAL

A. Sealants and Primers: Provide products having lower volatile organic compound (VOC) content than indicated in SCAQMD 1168.

2.4 NONSAG JOINT SEALANTS

A. Silicone Sealant: ASTM C920, Grade NS, Uses NT, M, G, A, and O; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 50 percent, minimum.
2. Nonstaining to Porous Stone: Nonstaining to light-colored natural stone and marble when tested in accordance with ASTM C1248.
3. Hardness Range: 15, Shore A, when tested in accordance with ASTM C661.
4. Color: To be selected by Architect from manufacturer's standard range.
5. Cure Type: Single component, neutral moisture curing.
6. Service Temperature Range: Minus 40 to 300 degrees F.
7. Products:
a. "DOWSIL 791" Silicone Sealant by Dow
b. "Sikasil WS-295" Silicone Sealant by Sika Corporation
c. "Spectrem 2" Silicone Sealant by Tremco

B. Polyurethane Sealant: ASTM C920, Grade NS, Uses T, NT, M, A, I, and O; single component, paintable; not expected to withstand continuous water immersion or traffic.
1. Movement Capability: Plus and minus 25 percent, minimum.
2. Hardness Range: 35 to 45, Shore A, when tested in accordance with ASTM C661.
3. Color: To be selected by Architect from manufacturer's standard range.
4. Service Temperature Range: Minus 40 to 180 degrees F.
5. Products:
a. "Sikaflex-1A" by Sika Corporation
b. "VulkemXTR" by Tremco

C. Acrylic Latex Sealant: ASTM C834; for use as interior acoustical sealant and general purpose interior caulking, paintable.
1. Color: To be selected by Architect from manufacturer's standard range.
2. Products:
a. "Sheetrock" Brand Acoustical Sealant by US Gypsum Corp.
b. "TrimFlex 834" Acrylic Latex Sealant by Tremco

2.5 ACCESSORIES

A. Sealant Backing Rod, Closed-Cell Type:
1. Cylindrical flexible sealant backings complying with ASTM C1330 Type C.
2. Size: 25 to 50 percent larger in diameter than joint width.
3. Products:
a. Nomaco, Inc; HBR: www.nomaco.com.
b. Substitutions: See Section 01 60 00 - Product Requirements.

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, nonstaining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.

D. Joint Cleaner: Noncorrosive and nonstaining type, type recommended by sealant manufacturer; compatible with joint forming materials.

E. Primers: Type recommended by sealant manufacturer to suit application; nonstaining.

PART 3 EXECUTION

3.1 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.

3.2 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.

3.3 INSTALLATION

A. Install this work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
B. Provide joint sealant installations complying with ASTM C1193.
C. Install acoustical sealant application work in accordance with ASTM C919.
D. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer.
E. Install bond breaker backing tape where backer rod cannot be used.
F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.
G. 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.
H. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

3.4 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for additional requirements.
B. Perform field quality control inspection/testing as specified in PART 1 under QUALITY ASSURANCE article.
C. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

END OF SECTION

PART 1 GENERAL

1.1 DESCRIPTION

A. Work included: Bronze clad interior and exterior doors, frames, transoms, and related glazing and hardware. All entrance and vestibule doors and frames shall be integral units consisting of doors, jambs, frames and transoms, and all related glazing, thresholds, operating mechanisms and all finish hardware as shown on the drawings and specified herein.

1.2 RELATED WORK

A. Section 05 50 00 - Metal Fabrications: steel header and transom support at bronze doors.
B. Section 06 10 53 - Misc. Rough Carpentry: wood blocking.
C. Section 07 92 00 - Joint Sealants: at interface of entrance assemblies and other building components.
D. Section 10 14 00 - Wayfinding Signage: signs attached to bronze doors or jambs.
E. Division 26 – Electrical: conduit, boxes and wiring for devices integrated or attached to bronze doors and frames, such as exit signs, security, fire alarm systems and power operators.

1.3 QUALITY ASSURANCE

A. The manufacturer must have been regularly engaged in the manufacture of bronze entrances and doors for a period of no less than ten (10) years.
B. All doors and frames must be engineered and fabricated by the same manufacturer.
C. Custom door subframes material to by type 6063 aluminum, minimum wall thickness of .125” and fully welded. Cladding to be Muntz sheet. Extrusions to be alloy C385.
D. The manufacturer must have a quality system registered to the ISO9001:2015 standard including design engineering.

1.4 SUBMITTALS

A. Shop drawings: Indicate in elevation with sections and details to scale. Include glass and metal thicknesses, joining details, field connections, anchorage, concealed and exposed fastening methods, door and framing reinforcement, and metal finishes. Indicate hardware arrangement details and interaction with surrounding material.
B. Three (3) finish samples, min. 5x7 inches, shall be submitted:
   1. Texture: #4, satin
   2. Color: Satin Bronze, matching Architect's sample.
C. Maintenance Data: Give instructions for general maintenance and repair of surfaces and finishes.

1.5 WARRANTY

A. All finished hardware and material to carry manufacturer’s standard warranty.
B. Warrant Bronze Doors, Frame and Glazed assemblies against defect in materials and workmanship for five (5) years beginning thirty days after shipment when handled, stored, and installed in accordance with manufactures instruction and NAAMM/HMMA Technical Manual. Clear coat manufacturer’s warranty applies.

1.6 DELIVERY, STORAGE AND HANDLING

A. Materials shall be packed, unloaded, stored and protected to avoid abuse and damage.
B. Protect finished surfaces with wrapping and/or strippable coating.
C. When unloading, remove all paper type wrappings that are wet or which could become wet.
D. Store inside, if possible, in clean well drained area free of dust and corrosive fumes.
E. Stack vertically or on edge so that water cannot accumulate on or within materials, using wood or plastic shims between components to provide water drainage and air circulation.

F. Cover materials with tarpaulins or plastic hung on frames to provide air circulation.
G. When installing, protect materials from lime, mortar, run-off from concrete and copper, weld splatter, acids, roofing tar, solvents and abrasive cleaners.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Louis Hoffman Co.; N93 W16112 Megal Drive, Menomenee Falls, WI 53051 Phone: (262) 251-7060
   1. Web site: www.louishoffmann.com. Email: bshermus@louishoffmann.com
B. Requests for substitutions will be considered in accordance with provisions of section 01 60 00 -Product Requirements.

2.2 MATERIALS AND FINISHES

A. Materials:
   1. Bronze cladding material: Muntz metal bronze alloy #280, minimum 0.05” thick
   2. Bronze extrusions and bars: alloy C385
B. Finish:
   1. Texture: Bronze, #4 satin
   2. Finish: Satin bronze finish is to be applied after fabrication to ensure a blemish free finish.
   3. Clear protective lacquer coating: None

2.3 DOORS AND FRAMES

A. Bronze Clad Doors: Stile and Rail Design
   1. Door thickness: 2 inch (nominal)
   2. Stiles: 5 inch at doors #1 and #2; 2-3/8 inch at doors #3 and #4
   3. Top rail: 5 inch at doors #1 and #2; 3-3/8 inch at doors #3 and #4.
   4. Exterior Top Cap: Provide flush top cap channel of alloy and finish matching door face, on exterior door #1.
   5. Bottom rail: 10 inch at all doors
   6. Intermediate vertical and horizontal bronze muntins for true divided light/multi-light construction:
      a. Bar material: 1/2 inch x 2 inch at doors #1 and #2; 3/8 inch x 2 inch at doors #3 and #4, including transoms.
      b. Glass stop moldings: Applied glass stops glass molding shall be permanently fixed on exterior side and screw attached type on interior side. Julius Blum # 6645 and custom extrusion profile as detailed – see Drawings.
   7. Base aluminum stile and rail door bodies shall be fully welded, unitized construction. Bolt, screw or tie-rod connections are not acceptable. Custom door bodies are to be sized to incorporate specified hardware and shall be formed from Type 6063 aluminum, minimum of .125-inch-thick material.
   8. Bronze Cladding: Minimum 0.05 inch thick. Clad door construction, longitudinal edges mechanically inter-locked with visible edge seams. Door panels will have visible face seams where stiles and rails intersect. Seams between stiles and rails shall be hairline and water tight. Prior to cladding base door body shall have a permanent coating applied which will prevent galvanic reaction. Cladding shall be applied to door with a tested, permanent, life time compression adhesive.
   9. Glass: clear laminated, low iron, ¼ inch total thickness
   10. Door Insulation: Applicable to doors #1 and #2 only: Polyurethane, cellular type, confirming to ASTM D 1622, 1.8 pound per cubic foot density minimum, containing no urea formaldehyde resins.
B. Bronze Clad Frames:

1. Cladding for door jambs, header and transom frames shall be formed from a minimum of 0.05 inch C280 Muntz Brass, finished to match doors.
   a. Clad frame profile: Single rebate for doors #1 and #2 and as detailed.
   b. Bronze profile trim on frame cladding: Julius Blum profile #6138 with mitered corners and countersunk flush fasteners, finish to match jambs.
   c. Bronze finish of cladding and trim profiles to match doors. Grain finishes shall have vertical grain in jambs and vertical mullions and horizontal grain in heads, sills, and horizontal mullions. Intersecting mullions, mullions and perimeters and connections between unequal face dimensions shall have visible butt joint connections.
   d. Hardware Prep: Jambs shall be prepared and reinforced for mortise templated hardware per hardware manufacturer templates and in accordance with NAAMM/HMMA.
2. Frame Core Material: type 6063 aluminum, minimum of .125-inch-thick.
3. Frames shall be erected without the use of exposed screws where feasible.
4. Transom Assemblies: Similar to door frames with bronze-clad aluminum tubes and solid bronze plate or bars to dimensions as detailed.
5. Glass stops at transom muntins:
   a. Julius Blum profile #6646 for doors #3 and #4
   b. Soldered to bronze bar framing on one side and fastened with countersunk screws on the other side for glazing installation and service.
6. Glass: clear, laminated, low iron, 1/4” total thickness.

2.4 HARDWARE AND WEATHERSTRIPPING

A. **Swing Door Hardware Set #1**

1. Insert same hinges as Set #2.
2. Power Operator: Overhead surface mount (low energy) Assa Abloy SW300 surface mounted for single swing door operation, push application.
   a. Provide remote wireless actuators Wikk Industries: S-4x4-3-US4-black ink 4-1/2” square.
   b. Control switch to be three position rocker switch mounted to end cap.
   c. Provide bronze clad operator enclosure in satin bronze finish to match bronze doors.
3. Door pull: Frank Allart pull handle model #8062, satin bronze unlacquered.
4. Panic hardware: Von Duprin 55 Rim Exit Device, bronze.
   a. Rim type for single door, 55-NL-x-x-110MD-299-RCB-SNB, US10A satin bronze.
   b. Cylinder core Schlage 20-022, satin bronze.
5. Kickplates: Rockwood K1125 – extra heavy duty.
   a. Push and pull sides, 1/8 inch bronze, beveled edges on 4 sides, screw mount with brass round head slotted screws, 8x32 inches, satin bronze finish to match doors.
6. Threshold: Saddle type, with fluted top, NGP 325BR, alloy 385, satin bronze finish, 5 inch wide x 1/2 inch tall.
   a. Provide brass fasteners and masonry anchors approximately 15 inches on center.
   b. Thresholds shall be set on the finished floor and adequately caulked against water seepage.
   c. Thresholds shall be 1/2 inch (13 mm) high x 6 inch (152 mm) wide saddle type.
7. Weatherstrip: manufacturer’s standard polypropylene pile.
   a. Install vertically and horizontally, continuously along door frame stop.
   b. Install door sweep, concealed mounted to underside of door.

B. **Swing Door Hardware Set #2:**

1. Hinges: 2 pair, full mortise type, five knuckle, ball bearing type, 5 x 4 1/2, stainless steel with plated satin bronze finish, ball tips, McKinney T4A3386.
2. Power Operator: Overhead surface mount (low energy) Assa Abloy SW300 surface mounted for single swing door operation, push application.
   a. Provide remote wireless actuators by Wikk Industries: S-4x4-3-us4-black ink 4-1/2" square.
   b. Control switch to be three position rocker switch mounted to end cap.
   c. Provide bronze clad operator enclosure in satin bronze finish to match bronze doors.
3. Door pull: Frank Allart pull handle model #8062, satin bronze unlacquered.
4. Push Bars: Rockwood BP47, 1 inch diameter x 31 inch bronze with base plates, custom finish US10A to match doors, concealed mounting.
5. Kickplates: Rockwood K1125 – extra heavy duty.
   a. Push and pull sides, 1/8 inch bronze, beveled edges on 4 sides, screw mount with brass round head slotted screws, 8x32 inches, satin bronze finish to match doors.
6. Weatherstrip: manufacturer's standard polypropylene pile.
   a. Install vertically and horizontally, continuously along door frame stop.

C. **Swing Door Hardware Set #3:**
1. Center Pivots: Frits Jurgens System M+FA NHO, double acting, soft close, classified to function with weight of the door.
2. Door Stops; Virtual Hardware "Ghostop" GS300 magnet pin assembly with recessed floor strike, satin bronze finish. Provide two (2) per leaf.
3. Door pulls: Frank Allart pull handle model #8062, satin bronze unlacquered, custom 25-5/16 inch lengths, back-to-back mounting.
4. Gasket: manufacturer's standard polypropylene pile.
   a. Install vertically and horizontally, continuously along door frame stop.

PART 3 EXECUTION

3.1 EXAMINATION

A. The installer/erector shall examine substrates, supports and conditions under which this work is to be performed and notify contractor, in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with work until unsatisfactory conditions are corrected.
B. The floor material shall be solid (not susceptible to either deterioration or heaving), smooth and level and the adjacent work in its proper place prior to the installation of the door and frame system.
C. Coordination dimensions, tolerances and method of attachment with other work.
D. Verify electric power is available and of correct characteristics, if required.

3.2 INSTALLATION/ERECTION

A. The installer/erector to install all materials by factory-trained personnel in strict accordance with installation data provided by manufacturer and these specifications.
B. Provide attachments and shims required to fasten system to building structure.
C. Install entrances plumb, level, square in alignment and true plane.
D. Install glass in accordance with manufacturer's instructions.
E. Install perimeter type sealant, backing materials to installation requirements.

3.3 ADJUSTING AND CLEANING

A. The installer/erector to fit, align and adjust door assembly.
B. Adjust door installation and hardware so that doors open and close smoothly.
C. Adjust speed to comply with applicable codes.

D. Remove protective materials from finished metal surfaces.
E. Clean exposed surfaces using materials and methods recommended by manufacturer, exercising care to avoid damage to coatings.
F. Touch-up damaged coatings and finishes.

3.4 PROTECTION

A. The contractor to institute protective measures required throughout the remainder of the construction period to ensure that the balanced door units will be without damage or deterioration, other than normal weathering, at the time of substantial completion.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Work in this Section includes all labor, materials, equipment, and services necessary to complete the seamless acoustic system, as shown on the drawings, finish schedules and/or defined and specified herein.

B. Two types of Seamless Acoustic Systems are specified for this project, as follows:
   1. Type A: To be located in the Rotunda.
   2. Type B: To be located in the Foyer and Reference Annex Room.

C. The work described in this Section and as shown on Drawings, Finish Schedules or as specified herein, shall be in accordance with the requirements of the Contract Documents.

1.2 RELATED REQUIREMENTS

A. Section 09 23 00 – Gypsum Plaster Repairs

B. Section 66 05 00 – Common work Results for Electrical

C. Section 26 50 10 – Lighting Fixtures, Lamps & Drivers: Recessed ceiling light fixtures

1.3 REFERENCE STANDARDS

A. ASTM C 423-22: Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method. ‘Type E’ or ‘Type A’ Mounting.

B. ASTM E 795-16: Standard Practices for Mounting Test Specimens During Sound Absorption Tests.

C. ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials

D. ASTM C842, Specification and Standards for Application of Interior Gypsum Plaster.

E. ASTM E 1477-98: Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating Sphere Reflectometer.

F. VOC Test - California Department of Public Health CDPH / EHLB / Standard Method Version 1.2, 2017

G. ASTM D 3273-16: Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber

1.4 QUALITY ASSURANCE

A. Certified installers
   1. All Contractors shall be certified by the manufacturer to install the BASWA Phon acoustic system by BASWA acoustic North America, LLC (855.902.2792 or info@baswana.com)

1.5 SUBMITTALS

A. Samples and Mockup
   1. Samples: Provide two 8-1/2” x 11” samples of the seamless acoustic system in selected color. Samples must show the complete panel thickness and all layers to be installed.
   2. Job Site Mockup: Install a 4’ x 4’ mock-up of each type and custom color of the seamless acoustic system, replicating relative details and conditions. Obtain mockup acceptance before any additional applications. Accomplish work to equal or exceed standard established by accepted job site mockup.

B. Product Data: Submit the following:
   1. Manufacturer's data sheets indicating compliance with specifications and applicable regulations and compatibility with substrate materials.
   2. Manufacturer's application procedures and requirements.
   3. Evidence of manufacturer's training and approval of the installing subcontractor and subcontractor's personnel for the application procedures required for this project.

4. Acoustic data from an independent acoustic testing laboratory indicating that the submitted product meets the absorption criteria in this specification.

1.6 TEST DATA

A. Acoustical Performance Data – Type A Product

1. Certified reports for Acoustical Performance Sound Absorption determined per ASTM C423 Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method for 'Type A' Mounting, conducted by an accredited, independent testing agency, shall be submitted upon request and meet the following minimum requirements. Noise Reduction Coefficient (NRC) rating for the 30 mm (1 3/16") system shall be 0.80 with frequency absorption coefficients as follows:
   a. Frequency Absorption
   b. (Hz) Coefficient
   c. 80 0.03
   d. 100 0.06
   e. 125 0.07
   f. 160 0.13
   g. 200 0.19
   h. 250 0.26
   i. 315 0.43
   j. 400 0.64
   k. 500 0.81
   l. 630 0.98
   m. 800 1.03
   n. 1000 1.09
   o. 1250 1.09
   p. 1600 1.05
   q. 2000 0.99
   r. 2500 0.98
   s. 3150 0.90
   t. 4000 0.85
   u. 5000 0.84

B. Acoustical Performance Data – Type B Product

1. Certified reports for Acoustical Performance Sound Absorption determined per ASTM C423 Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method for 'Type A' Mounting, conducted by an accredited, independent testing agency, shall be submitted upon request and meet the following minimum requirements. Noise Reduction Coefficient (NRC) rating for the 30 mm (1 3/16") system shall be 0.80 with frequency absorption coefficients as follows:
   a. Frequency Absorption
   b. (Hz) Coefficient
   c. 80 0.04
   d. 100 0.02
   e. 125 0.07
   f. 160 0.15
   g. 200 0.20
   h. 250 0.26
   i. 315 0.49
   j. 400 0.71
   k. 500 0.85
   l. 630 0.98
   m. 800 1.03

n. 1000 1.07
o. 1250 1.06
p. 1600 1.04
q. 2000 0.98
r. 2500 0.97
s. 3150 0.89
t. 4000 0.85
u. 5000 0.83

C. Fire Test Data - Types A and B Products
1. Certified reports for Surface Burning Characteristics determined per ASTM E 84 Twenty-Five Foot Tunnel Furnace Test Method, conducted by an accredited, independent testing agency, shall be submitted upon request and meet the following minimum requirements:
a. Class A Flame Spread Classification
1) 20 Flame Spread or less
2) 15 Smoke Development or less

D. Mold Test Data - Types A and B Products:
1. Certified reports for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber determined per ASTM D3273-16 and per ASTM G-21F, conducted by an accredited, independent testing agency, shall be submitted upon request and meet the following minimum requirements:
a. 10 / 10 – Week 4 – No Defacement
b. Rating of 0

E. Light Reflectance Test Data:
1. Certified Reports for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating Sphere Reflectometer determined by ASTM E 1477-98, conducted by an accredited, independent testing agency, shall be submitted upon request and meet the following minimum requirements:
a. Type A: Light Reflectance Value ‘L’ a minimum of 89.7.
b. Type B: Light Reflectance Value ‘L’ a minimum of 91.3.

F. VOC Emission Test Data:
1. For each system component, Certified Reports for California Department of Public Health CDPH / EHLB / Standard Method Version 1.2, 2017, conducted by an accredited, independent testing agency, shall be submitted upon request and meet the following minimum requirements:
a. Classroom – VOCs of Concern: ≤½ Chronic REL, Compliant; Formaldehyde: ≤9.0 µg/m3, Compliant; TVOC range: ≤ 0.5 mg/m3. No formaldehyde detected.
b. Office – VOCs of Concern: ≤½ Chronic REL, Compliant; Formaldehyde: ≤9.0 µg/m3, Compliant; TVOC range: ≤ 0.5 mg/m3. No formaldehyde detected.

G. Thermal Performance - Types A & B Products:
a. R-value of W/(m*K) of 0.044 or greater.

1.7 REFERENCES
A. ASTM C 423-22: Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method (Type A’ Mounting).
B. ASTM E 795-16: Standard Practices for Mounting Test Specimens During Sound Absorption Tests.
C. ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials
D. ASTM C842, Specification and Standards for Application of Interior Gypsum Plaster.
E. ASTM E 1477-98: Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating Sphere Reflectometer.
F. VOC Test - California Department of Public Health CDPH / EHLB / Standard Method Version 1.2, 2017

G. ASTM D 3273-16: Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber

1.8 DELIVERY, STORAGE, AND HANDLING

A. Ship and deliver in protective packaging to prevent freight damage.
B. Allow materials to become acclimated to installation area conditions 24 hours before installation.
C. Store materials in accordance with manufacturer's recommendations in a fully enclosed space where materials will be protected against damage from direct sunlight, moisture, surface contamination, and other causes.
D. Protect seamless acoustic system materials from freezing. Product that has frozen cannot be used and is not warranted.

1.9 PROJECT CONDITIONS

A. Environmental Requirements: Comply with requirements of referenced plaster application standards per ASTM C842 and recommendations of product manufacturer for environmental conditions before, during, and after installation.
B. Temperature Requirements: Where ambient outdoor temperature at the building site is less than 55º F (13º C), a temperature of not less than 55º F and not more than 80º F shall be maintained continuously in the area of the installation for a period of not less than one week prior to the application of seamless acoustic system. Temporary heat shall be evenly distributed to prevent concentrated uneven heat or cold on the seamless acoustic system or its substrate. Acceptable temperature range shall be maintained until the permanent HVAC system is activated.
C. Ventilation: Ventilate building spaces as required to remove excess moisture to promote drying of the applied materials. Use of gas heaters is not recommended as they typically increase relative air humidity, whereby the drying time is considerably extended.
D. Prevent strong fluctuations in temperature and relative humidity, care must be taken to ensure that the dew point is not located on the surface or within the seamless acoustic system. Moisture caused by condensation in the room air can cause damage to the seamless acoustic system.
E. Protect contiguous work from soiling, splattering, moisture deterioration, and other harmful effects that may be caused by the application of the materials.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Materials and installation shall be based upon the BASWA Phon acoustic system's performance, specifications, planning documents, and details as supplied by BASWA acoustic North America, LLC, www.baswana.com, 855.902.2792, info@baswana.com. No substitutions allowed.
B. Type A Product – Installed in Rotunda: "BASWA" 30 mm Phon "Frost" Acoustic System.
   1. The BASWA Phon Frost acoustic system shall be provided in a total system thickness of 30 mm (1 3/16").
   2. The BASWA Phon Frost acoustic system shall consist of a 26mm (1") BASWA Phon system panel, an application of BASWA Fill, a trowel-applied coat of BASWA Base, and a spray-applied finish coat of BASWA Base.
C. Type B Product – Installed in Foyer and Reference Annex: "BASWA" 30 mm Phon "Classic Fine" Acoustic System.
   1. The BASWA Phon Classic Fine acoustic system shall be provided in a total system thickness of 30 mm (1 3/16").
   2. The BASWA Phon Classic Fine acoustic system shall consist of a 26mm (1") BASWA Phon system panel, an application of BASWA Fill, a trowel-applied coat of BASWA Base and a trowel-applied finish coat of BASWA Fine.

D. Trim: For both Type A and Type B Products:
   1. All corner beads, terminations, control joints, or other trim pieces shall be white vinyl BASWA proprietary beads. Specialty beads and reveals in profiles approved by BASWA acoustic.
   2. Trims shall be installed with Trim-Tex 847 Spray Adhesive; no other adhesive is approved.

E. Color:
   1. Type A – Phon Frost: The trowel-applied finish coat of BASWA Base and spray-applied BASWA Fine shall be tinted by the addition of BASWA Colors tint additive. Color shall match the following:
      a. For Rotunda: Sherwin Williams #SW 7662 “Evening Shadow”
   2. Type B – Phon Classic Fine: The trowel-applied coats of BASWA Base and BASWA Fine shall be tinted by the addition of BSWA Colors tint additive. Color shall match the following:
      a. For Foyer: Sherwin Williams #SW 7662 “Evening Shadow”
      b. For Reference Annex: Sherwin Williams #SW 7676 “Paper Lantern”

F. BASWA Protect Surface Protectant:
   1. A spray application of BASWA Protect shall be applied to the finished surface after system has completely dried for a minimum of 12 hours. The non-bridging coating resists stains and improves cleanability without negatively affecting acoustical absorption. Application and coverage shall be per manufacturer’s approved application guidelines.

PART 3 – EXECUTION

3.1 INSPECTION

A. Examine areas where, and conditions under which, the selected BASWA Phon acoustic system is to be installed. Correct any conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected to permit the proper installation of the work.

B. Verify that all mechanical and electrical services within the area of application have been roughed in at the appropriate depth relative to the thickness of the system; tested and approved, prior to commencement of application. Review approved details provided by BASWA acoustic for verification.

3.2 ACCEPTABLE SUBSTRATE

A. General
   1. The BASWA Phon acoustic systems must be installed over an air-tight stable substrate. All penetrations shall be closed-off to prevent air from passing through the substrate and into the plenum above, or vice versa.
   2. All HVAC, electrical, fire sprinkler, and other penetrations of the substrate shall be sealed with traditional drywall tape or a self-adhesive tape to prevent air movement between the plenum and finished space or vice versa.
   3. Adhesive Strength required for bonding to the substrate surface for the application of the BASWA Phon acoustic system is a minimum of 17 N/psf.
   4. Plywood substrates are not acceptable due to the potential of excessive expansion and contraction movement.
   5. All substrates for the application shall not vary from plumb, level, or a “smooth consistent curvature” by more than a total of 1/8 inch in 10 feet. BASWA replicate will follow the substrate.

B. Substrate Material
   1. Existing substrates with glossy paint, metal surfaces, previously painted drywall, masonry, and concrete, shall be primed with Sherwin Williams “Preprite Bonding Primer” or equal, installed per paint manufacturer’s specifications.

3.3 INSTALLATION

A. General Information and Requirements

1. BASWA Jet Pump – For Type A Product's Spray Applied Finish Coat:
   a. BASWA spray finishes are applied by use of the BASWA Jet pump. The proper notched gauging trowels and smoothing trowels shall be used at each step noted below in order to control material thickness. BASWA Jet pump is supplied by BASWA acoustic.
2. Hand Tools – For Type A Product:
   a. All applications of BASWA Phon system panels, BASWA Fill, trowel-applied BASWA Base and spray-applied BASWA Base must be facilitated by using the proper BASWA stainless steel flat or notched hand trowels available from BASWA acoustic. The proper notched gauging trowels and smoothing trowels shall be used at each step noted below to control material thickness.
3. Hand Tools – For Type B Product:
   a. All applications of BASWA Phon system panels, BASWA Fill, and trowel-applied coat of BASWA Fine must be facilitated by using the proper BASWA stainless steel flat or notched hand trowels available from BASWA acoustic. The proper notched gauging trowels and smoothing trowels shall be used at each step noted below to control material thickness.
4. Lighting
   a. Inherent in all hand troweled product applications, minor acceptable trowel marks or imperfections in the finished surface may occur and become exposed or exaggerated under critical lighting. Ensure that the lighting used during the entire installation process replicates the actual finished lighting. All skylights, clearstory windows and other openings which naturally light the area of the installation shall be uncovered during the entire installation to represent finished conditions.
5. Drying Times
   a. Type A Product: Drying time for the BASWA Fill and BASWA Base are typically overnight, however, drying times may be longer due to unusual on-site conditions. Prior to proceeding with any additional work, ensure BASWA Fill, BASWA Base are completely and thoroughly dry.
   b. Type B Product: Drying time for the BASWA Fill and BASWA Fine are typically overnight, however, drying times may be longer due to unusual on-site conditions. Prior to proceeding with any additional work, ensure BASWA Fill and BASWA Base layers are completely and thoroughly dry, prior to installation of the final Fine layer.
6. Finish Coat Installation – Type A Product:
   a. Application of the trowel-applied BASWA Base shall be facilitated in one operation at each area of installation.
   b. Once Base coat is dry, application of the spray-applied BASWA Base shall be facilitated in one operation at each area of installation.
7. Finish Coat Installation – Type B Product:
   a. Application of the trowel-applied BASWA Base shall be facilitated in one operation at each area of installation.
   b. Application of the trowel-applied BASWA Fine shall be facilitated in one operation at each area of installation.
8. Staging
   a. Generally, the BASWA Phon acoustic system can be installed using full "tiered scaffolding with outriggers" on wall applications and/or a full "dance floor scaffolding" on ceiling applications in order to achieve an acceptable finish without "cold joints". Rolling tower scaffolds which can be moved across an installation area may also be acceptable.
9. Securing to BASWA

a. Light fixtures, ornamentation, speakers, cover plates, or any other items cannot be attached to the BASWA Phon acoustic system. Ensure items are secured to a BASWA Installation Platform, proper blocking, or other approved attachment system independent of the BASWA Phon acoustic panel per BASWA-approved details.

B. Installation procedures
1. Install BASWA Phon acoustic system in accordance with BASWA acoustic's planning documents, installation instructions, and details. Installation shall start only after all other work in the area of the installation has been completed.
a. BASWA Phon system panels:
1) For both Type A and B products: Apply 2mm thick layer of plaster-based adhesive to the mineral wool back face of the BASWA Phon panel. Panel is pressed firmly onto and fully adhered to the stable substrate. Ensure that panels are set as level and as smooth to each other as practicable.
2) Curved surfaces - Type A Product: On domed, curved and warped surfaces, the back face of the mineral wool of the BASWA Phon panel is factory-kerfed at 3 inches on center, in one or two directions, to facilitate ease of shaping in either the convex or concave directions.
3) For both Type A and B products: Stagger joints between panels and install with short side of panel parallel to critical light source.
b. Trim:
1) For both Type A and B Products: Install white vinyl BASWA proprietary trim pieces. Trims shall be installed with Trim-Tex 847 Spray Adhesive; no other adhesive is approved.
c. BASWA Fill at flat ceiling installations – Type B Product:
1) Fill seams between BASWA Phon panels with BASWA Fill. Cover all white vinyl trim with BASWA Fill. Sand Fill smooth when completely dry.
2) Do not tint BASWA Fill.
d. BASWA Fill at Domed, Vaulted, and Curved Areas – Type A Product:
1) Apply a 2.0 – 3.0mm thick layer of BASWA Fill over domed, vaulted, or curved areas and over all white vinyl trim where extreme critical light conditions exist or radius is less than 2 feet. Trowel smooth. Sand smooth when completely dry prior to applying BASWA Base.
e. Trowel-applied Coat of BASWA Base in Custom Color - Type A & B Products:
1) Custom color is specified above in Part 2 – PRODUCTS, Section 1.2.
2) Prior to applying the coat of BASWA Base, add one vial of BASWA Colors tint additive per bucket. Ensure product is thoroughly mixed and all buckets are continuously batched together to provide even, consistent color over the entire area.
3) Apply a 3.0 – 4.0mm thick layer and trowel smooth. Sand smooth when completely dry.
4) Note that BASWA systems are hand-crafted finish products. Inherent in all hand-crafted products, minor acceptable trowel marks and other imperfections in the finished surface may occur which are only visible at certain times of day or under certain critical lighting conditions. The finish should be critically viewed only under end-use lighting conditions.
f. Spray-applied Finish Coat of BASWA Base in Custom Color - Type A Product:
1) Custom color is specified above in Part 2 – PRODUCTS, Section 1.2.
2) Prior to applying the coat of BASWA Base, add one vial of BASWA Colors tint additive per bucket. Ensure product is thoroughly mixed and all buckets are continuously batched together to provide even, consistent color over the entire area.
3) Evenly spray apply a 0.5 – 1.0mm thick layer.

4) Note that BASWA systems are hand-crafted finish products. Inherent in all hand-crafted products, minor acceptable trowel marks and other imperfections in the finished surface may occur which are only visible at certain times of day or under certain critical lighting conditions. The finish should be critically viewed only under end-use lighting conditions.

g. Trowel-applied Finish Coat of BASWA Fine in Custom Color - Type B Product:
   1) Custom color is specified above in Part 2 – PRODUCTS, Section 1.2. Prior to applying the coat of BASWA Fine, add one vial of BASWA Colors tint additive per bucket. Ensure product is thoroughly mixed and all buckets are continuously batched together to provide even, consistent color over the entire area.
   2) Apply a 3.0 – 4.0mm thick layer and trowel smooth.
   3) Note that BASWA systems are hand-crafted finish products. Inherent in all hand-crafted products, minor acceptable trowel marks and other imperfections in the finished surface may occur which are only visible at certain times of day or under certain critical lighting conditions. The finish should be critically viewed only under end-use lighting conditions.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Plaster patching of deteriorated existing surfaces.
B. Plaster patching related to trenching of existing walls for the accommodation of new electrical and building system conduits.
C. Plaster patching of Rotunda pilasters where devices were removed, and where electrical switches are being replaced.
D. Plaster patching at Rotunda entablature field panels where new uplights are being installed.
E. Plaster patching at existing ceilings in project spaces; identify areas with water and other damage.
F. Plaster patching at existing downlight openings and at new light fixture and device locations.

1.2 RELATED REQUIREMENTS:

A. Section 07 84 00 - Firestopping: Sealing through-wall penetrations at fire rated walls.
B. Section 07 92 00 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

1.3 REFERENCE STANDARDS

A. ASTM C28/C28M - Standard Specification for Gypsum Plasters; 2026.
B. ASTM C35 - Standard Specification for Inorganic Aggregates for Use in Gypsum Plaster; 2001 (Reapproved 2019).
C. ASTM C61/C61M - Standard Specification for Gypsum Keene's Cement; 2026.
D. ASTM C206 - Standard Specification for Finishing Hydrated Lime; 2014 (Reapproved 2022).
E. ASTM C631 - Standard Specification for Bonding Compounds for Interior Gypsum Plastering; 2009 (Reapproved 2020).
F. ASTM C841 - Standard Specification for Installation of Interior Lathing and Furring; 2023.
G. ASTM C842 - Standard Specification for Application of Interior Gypsum Plaster; 2005 (Reapproved 2025).
H. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2024.
I. GA-600 - Fire Resistance and Sound Control Design Manual; 2024.
J. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
K. UL (FRD) - Fire Resistance Directory; Current Edition.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittals procedures.
B. Product Data: Provide data on plaster materials, characteristics, and limitations of products specified.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section with minimum 5 years documented experience.

1.6 FIELD CONDITIONS

A. Do not apply plaster when substrate or ambient air temperature is under 50 degrees F or over 80 degrees F.
B. Maintain minimum ambient temperature of 50 degrees F during and after installation of plaster.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Gypsum Plaster:
   1. Gold Bond Building Products, LLC provided by National Gypsum Company: www.goldbondbuilding.com.
   2. US Gypsum Corp.: www.usg.com.
   3. National Gypsum Co.: www.nationalgypsum.com.

2.2 PLASTER MATERIALS

A. Gypsum Neat Plaster: ASTM C28/C28M.
B. Ready-Mixed Gypsum Plaster: ASTM C28/C28M; mill-mixed type, requiring only the addition of water.
C. Gypsum Keene's Cement: ASTM C61/C61M.
D. Lime: ASTM C206, Type S; special finishing hydrated lime.
E. Aggregate for Base Coats: ASTM C35; sand and lightweight aggregates.
   1. Lightweight Aggregate: Vermiculite or Perlite.
F. Ready-Mixed Finishing Plaster: Gypsum/Lime putty type; ASTM C28/C28M ; mixture of gauging plaster and lime.
G. Ready-Mixed Finishing Plaster: Keene's cement/lime putty type; ASTM C61/C61M and ASTM C206.
H. Ready-Mixed Finishing Plaster: Sand float type; ASTM C28/C28M and ASTM C35 ;prepared mixture of gypsum plaster and sand.
I. Aggregate for Finish Coats: As specified in ASTM C842.
J. Water: Clean, fresh, potable and free of mineral or organic matter that could adversely affect plaster.
K. Bonding Agent: ASTM C631 ; Type recommended by manufacturer for bonding plaster, monolithic concrete, concrete block, and gypsum lath surfaces.

2.3 LATH AND ACCESSORIES

A. Metal Lath and Accessories: As specified in Section 09 22 36.
B. Gypsum Lath: ASTM C1396/C1396M, standard type.
   1. Thickness: 3/8 inch.
   2. Thickness: As indicated.
C. Finishing Accessories: ASTM C841, extruded aluminum alloy (6063 T5), galvanized steel sheet ASTM A924/A924M G90, galvanized steel wire, and rolled zinc, unless noted otherwise.
   1. Types: As detailed or required for finished appearance.
   2. Special Shapes: In addition to conventional corner bead and control joints, provide U-bead at exposed plaster edges.
D. Beads, Screeds, Joint Accessories, and Other Trim: Depth governed by plaster thickness, maximum possible lengths.
   1. Material: Formed aluminum, solid flanges.
   2. Material: PVC, open grid flanges or perforated with nailing holes.
   3. Casing Beads: Square edges.
   4. Corner Beads: Radiused corners.
   5. Base Screeds: Bevelled edges.
   6. Expansion Joints: Accordion profile with factory-installed protective tape, 2 inch wide flanges.
   7. Control Joints: Accordion profile with protective tape, 2 inch flanges.
E. Corner Mesh: Formed sheet steel, minimum 0.018 inch thick, perforated flanges shaped to permit complete embedding in plaster, minimum 2 inch size; galvanized.
F. Strip Mesh: Expanded metal lath, minimum 0.018 inch thick, 2 inch wide by 24 inch long; galvanized.

G. Fasteners: Nails, staples, or other approved metal supports, of type and size to suit application, to rigidly secure accessories in place.
H. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.

2.4 PLASTER MIXES
A. Mix and proportion plaster in accordance with ASTM C842 and manufacturer's written instructions of applications indicated.
B. Ready-Mixed Plaster Materials: Mix in accordance with manufacturer's instructions.

PART 3 EXECUTION

3.1 EXAMINATION
A. Verify that existing conditions are satisfactory before starting work.
B. Grounds and Blocking: Verify items within walls for other sections of work have been installed.
C. Metal Lath and Accessories: Verify lath is flat, secured to substrate, and joint and surface perimeter accessories are in place.
D. Mechanical and Electrical: Verify services within walls have been tested and approved.

3.2 PREPARATION
A. Dampen masonry surfaces to reduce excessive suction.
B. Apply bonding agent in accordance with manufacturer's instructions.

3.3 PLASTER PATCHING
A. Cut back loose and unsound plaster adjacent to patch. Back cut edge of adjacent plaster to form dovetail of new plaster into existing plaster.
B. Ensure base and substrate are sound and ready to receive repair.
C. Apply bonding agent if needed to bond new work to existing.
D. Apply scratch, brown and finish coats as needed to match existing surfaces. Finish flush and smooth.

3.4 TOLERANCES
A. Maximum Variation from True Flatness: 1/8 inch in 10 feet.

END OF SECTION

PART 1 - GENERAL

1.1 WORK INCLUDES

A. All labor and materials for interior cut stone items listed below and indicated on the Drawings, including:
   1. Stone tile replacement units
   2. Stone base replacement units
   3. Circulation Desk supplemental top and side panels
   4. Stone countertops and bases at new millwork items
   5. Reference Annex fireplace hearth replacement
   6. Replacement of selected fireplace surround panels.
   7. Repairs and replacements of broken or missing trim at recessed radiator air inlets.
   8. Stone bases at radiator enclosures.

B. Unit Prices:
   1. Unit Price: General Contractor to provide a unit price for all work of this Section related to Stone Flooring Restoration - Section 08 63 73.

1.2 RELATED REQUIREMENTS:

A. Specified elsewhere:
   1. Section 06 10 53 – Miscellaneous Rough Carpentry: Wood blocking and supports.
   2. Section 06 41 00 – Architectural Wood Casework: New millwork cabinetry integrated into renovated marble Circulation Desk.
   3. Section 07 92 00 – Joint Sealants: At interior corners and dissimilar materials.
   4. Section 09 63 73 - Stone Flooring Restoration: Stone tile replacement units.
   5. Section 10 31 00 – Fireplace Repairs: Fireplace repairs and new equipment at stone hearth at Reference Annex Room fireplace.

1.3 REFERENCES

A. American National Standards Institute:
   1. ANSI A118.3 - Chemical-Resistant, Water-Cleanable, Tile-Setting and -Grouting Epoxy and Water-Cleanable Tile-Setting Epoxy Adhesive.
   2. ANSI A118.6 - Ceramic Tile Grouts.
   3. ANSI A118.8 - Modified Epoxy Emulsion Mortar/Grout.

B. ASTM International:
   1. ASTM C503 - Standard Specification for Marble Dimension Stone

C. MIA (Marble Institute of America) – Design Manual IV.

D. Tile Council of America:
   1. TCA - Handbook for Ceramic Tile Installation.

1.4 SUBMITTALS

A. Section 01 30 00 – Administrative Requirements: Submittal procedures.

B. Shop Drawings:
   1. Submit stone supplier's installation instructions and field erection drawings.
   2. Indicate stone layout, patterns, perimeter conditions, junctions with dissimilar materials and setting details.

C. Product Data:
   1. Submit instructions for grout.
   2. Submit cleaning materials and methods for cleaning.

D. Samples:
   1. Submit stone on plywood panels, 12 x 12 inch in size illustrating pattern, color variations, edge profiles and shapes and grout joint size variations.
   2. Submit sample of colored grout.

E. Mock-up:
   1. Provide field mock-up of modifications to Circulation Desk.
   2. Include grout and accessories
   3. Remove mock-up when directed by Architect.

1.5 COORDINATION
A. Coordinate stonework with work of other trades.

1.6 CLOSEOUT SUBMITTALS
A. Section 01 78 00 – Closeout Submittals:
   Submit recommended cleaning methods, cleaning materials, stain removal methods, and polishes and sealers.
   1. Include list of liquids detrimental to appearance of stone finish.

1.7 QUALITY ASSURANCE
A. Perform Work in accordance with TCA Handbook for instructions applicable to mortar setting bed, thin-setting and grouting.
B. Perform Work in accordance with MIA Handbook Design Manual (latest edition) for instructions applicable setting interior cut stone on mortar bed for floors, thin-setting wall panels and grouting entire assembly.

1.8 QUALIFICATIONS
A. Fabricator: Company specializing in performing Work of this section with minimum ten years documented experience.
B. Installer: Company specializing in performing Work of this section with minimum ten years documented experience.

1.9 PRE-INSTALLATION MEETINGS
A. Section 01 30 00 – Administrative Requirements - Project Meetings: Pre-installation meeting to determine procedures for site installation of the work of this section.
B. Convene minimum two weeks prior to commencing work of this section.

1.10 DELIVERY, STORAGE & HANDLING
A. Section 01 60 00 – Product Requirements: Storage and Protection
B. Shop fabricate stone pieces in largest practical sections, but allowing for delivery clearances into building.
C. Review joint placement with Architect.
D. Protect stone pieces from damage during shipping and delivery.
E. Store stone on site in a cool dry location and protected from damage.

1.11 CLOSEOUT SUBMITTALS
A. Section 01 78 00 – Closeout Submittals: Operating and Maintenance Data:
   1. Closeout procedures.
      a. Maintenance Data: Submit recommended cleaning methods, cleaning materials, and stain removal methods.

1.12 ENVIRONMENTAL REQUIREMENTS
A. Maintain a minimum of 50 degrees F during installation of stone materials.

PART 2 - PRODUCTS

2.1 INTERIOR CUT STONE
A. Stone Fabricator and Installer:

1. Galloy and Van Etten, Inc/Murphy Marble Co., 11756 S. Halsted St. Chicago, IL 60628 (773) 928-4800; https://www.galloyvanetten.com/
   a. This preferred fabricator/installer has the requisite skills and material availability to accomplish the detailed dismantlement, fabrication of new elements and the re-assembly of the Rotunda's circulation desk, a significant building element.

2.2 COMPONENTS

A. Stone Floor Tile Replacement Units: ASTM C503 Classification; free of defects detrimental to appearance or durability:
   1. Type: Vermont Danby Montclair
   2. Unit Size: 24" x 24" (Verify in field)
   3. Thickness: 1.25 inch thick.
   4. Color: White with black and gray markings
   5. Surface Finish: High honed, but verify with Architect in field to match existing and to determine the level of slip-resistance.

B. Stone Floor Tile Replacement Accent Pieces & Wall Baseboards: C503 Classification; free of defects detrimental to appearance or durability:
   1. Type: Nero Marquina
   2. Unit Size: 3" x 3" (Verify in field).
   3. Thickness: 0.75" / 1-3/16" (verify with Architectural Drawings).
   4. Color: Black with white markings
   5. Surface Finish: High honed, but verify with Architect in field to match existing and to determine the level of slip-resistance.
   6. Use fiberglass mesh backing on back of Nero Marquina base elements where indicated on the drawings.

C. Stone Floor Tile Replacement at Vestibule Entry Door: C503 classification; free of defects detrimental to appearance or durability:
   1. Type: Absolute Black Granite
   2. Unit Size: Varies (Verify in field).
   3. Thickness: 0.75"
   4. Color: Black
   5. Surface Finish: High Honed, but verify with Architect in field to match existing and to determine level of slip-resistance.

D. Stone for Circulation Desk: ASTM C503 Classification; free of defects detrimental to appearance or durability:
   1. Type: Bardiglio Fiorito (Italy)
   2. Unit Size: As shown on drawings
   3. Thickness and Profile: To match existing
   4. Color: White and gray with dark gray/blue directional veining to match stone of existing.
   5. Surface Finish: Polished to match existing

E. Stone Countertops & Base for Adult Services Workstations: ASTM C503 Classification; free of defects detrimental to appearance or durability:
   1. Type: Petit Granit
   2. Unit Size: As shown on drawings.
   3. Thickness: 1.25" thick
   4. Color: Dark gray black with fossil insets
   5. Surface Finish: Polished

F. Reference Annex Fireplace Hearth: ASTM C503 Classification; free of defects detrimental to appearance or durability:
   1. Type: Petit Granit
   2. Color: Dark gray black with fossil insets
   3. Surface Finish: Honed to 1200 Grit

4. Thickness: To match existing
5. Size: As shown on the drawings
6. Exposed edges to have 1/4" bevel

G. Organic Adhesive: ANSI A136.1, Type I thin-set bond type.
H. Epoxy Adhesive: ANSI A118.3, thin-set bond type
I. Mortar Materials: TCA A118.1 Dry Set, Portland cement, sand, and water.
J. Mortar Materials: TCA A118.4 Latex Portland cement, sand, and water.
K. Portland Cement: ASTM C150, Type I; grey color.
L. Sand: ASTM C144, or ASTM C33, depending on stone type, Sharp, coarse, clean, screened sand, free from deleterious materials.
M. Water: Potable.
N. Grout: ANSI A118.6, tile grout, color as selected.

2.3 ACCESSORIES

A. Crack Isolation Membrane: Where indicated, provide crack isolation membrane. Install according to manufacturer's instructions.
B. Anchors, dowels and ties: Non-staining, stainless steel to ASTM A167, Type 304, of sizes and configurations required for support of stone and applicable superimposed loads.
C. Supports and Lifting Devices: Stainless steel type 304; removable type for panels in excess of 75 lbs.
D. Setting Shims: Plastic type
E. Spacers: Inorganic
F. Sealant: Silicone type, non-bleeding, non-staining as specified in Section 07 92 00 – Joint Sealants.
G. Cleaner: Recommended by stone producer and grout manufacturer, which will not harm stone, joint materials, or adjacent surfaces.
H. Sealer: Colorless, slip and stain resistant which will not detrimentally affect stone and adjacent work.
I. Fiberglass mesh reinforcement backing behind Nero Marquina base elements.

2.4 FABRICATION

A. Form stone into panel sizes and thickness as indicated on drawings.
B. Fabrication Tolerances:
   1. Maximum Variation From Thickness: 1/32 inch.
   2. Maximum Variation From Face Size: 1/32 inch.
   3. Maximum Variation From Flat: 1/32 inch/sq ft.
C. Grain Direction:
   1. Circulation Desk: Match grain direction of existing components.
   2. Countertops: Horizontal
   3. Base: Horizontal
D. Vertical Stone Panels:
   1. Cut and drill sinkages and holes in stone back for anchors, fasteners, supports, and lifting devices as indicated or needed to set stone securely in place; shape beds to fit supports.
E. Countertops:
   1. Cut countertops accurately to shape and dimensions shown on final shop drawings, maintaining fabrication standards of MIA.

2.5 SOURCE QUALITY CONTROL

A. Provide shop testing of sealants for compatibility with stone using stone samples provided.
B. Test for adhesion and staining

PART 3 – EXECUTION

3.1 WASTE MANAGEMENT

A. Coordinate waste management with Owner's Building Superintendent.

3.2 EXAMINATION

A. Section 01 30 00 – Administrative Requirements: Coordination.
B. Establish lines and levels
C. Verify surfaces are ready to receive work.

3.3 PREPARATION

A. Clean substrate surfaces; damp clean stone.
B. Fill substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.
C. Clean stone prior to installation, with edges and surfaces free of dirt or foreign material.
D. Do not use wire brushes or implements capable of marking or damaging exposed surfaces.

3.4 INSTALLATION

A. Installation of Stone Countertops:
    1. Install stone as indicated on approved shop and setting drawings.
    2. Shim and adjust for proper alignments and level.
    3. Install adjacent pieces so that they are flush and flat.

3.5 CLEANING OF NEW WORK

A. Section 01 70 00 – Execution and Closeout Requirements: Final cleaning.
B. Clean stone and grout surfaces with cleaner; seal with sealer.

3.6 PROTECTION OF INSTALLED CONSTRUCTION

A. Protect installed work with plywood over cushioning plastic layer and rosin paper.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. All labor and materials for interior stone floor restoration items indicated on the Drawings:
   1. Stripping built-up coatings on stone flooring surfaces using chemical cleaning agents.
   2. Removing stains from stone flooring surfaces using poultices.
   3. Reparing damaged stone flooring uints.
   4. Replacing stone units that cannot be repaired.
   5. Wet honing stone flooring with diamond abrasives to remove scratches and smooth the surface.
   6. Protection of existing adjacent surfaces during cleaning process.
   7. Protection of finished flooring with penetrating sealer.

B. Unit Prices:
   1. Unit Price No. 4: General Contractor shall provide a unit price for all labor and materials for a complete system in this specification, including:
      a. Stone Unit Replacement per Section 01 22 00 - Unit Prices.

1.2 RELATED REQUIREMENTS

A. Specified Elsewhere:
   1. Section 09 63 20 – Interior Cut Stone: New interior stone and repair of existing.

1.3 REFERENCES

A. MIA (Marble Institute of America) – Dimension Stone Design Manual (current version)
B. Secretary of the Interior's Standards for the Treatment of Historic Properties.
C. U.S. General Services Administration Preservation Note 35 – Restoring and Maintaining Stone Flooring
D. GSA Historic Preservation Technical Procedures – Various articles applicable to stone cleaning and restoration. http://www.gsa.gov/historicpreservation.

1.4 SUBMITTALS

A. Section 01 30 00 – Administrative Requirements: Submittal Procedures.
B. Product Data:
   1. Submit manufacturer's specifications and installation instructions for products used.
   2. Submit manufacturer's technical data sheet for products indicated including recommendations for their application and use.
   3. Submit safety precautions and recommendations for protection of adjacent surfaces.
C. Work Plan:
   1. The proposed Work Plan should identify the work sequence and schedule of cleaning and restoration operations indicating time of day work will be performed.
   2. The proposed Work Plan should identify all scaffolding, construction aids, barriers, and any temporary protection measures to be used.
   3. The proposed Work Plan should describe capture, storage, and disposal or waste water and spent cleaners as required and/or governed by any and all local, state, and/or federal laws, codes, and regulations.
   4. The proposed Work Plan should describe methods for dust control.
   5. The proposed Work Plan should include a man power list and how cleaning operations affect the larger construction schedule; coordinate with General Contractor.
   6. Test Panel/Mockups showing sequence of stripping, sleaning and honing:
      a. The Contractor shall arrange for providing test panels. Minimum size of stone flooring test panels should be a 4 ft. by 4 ft. area and include each variety of stone.

7. Contractor to provide test panels to get to an approved finish. Locate test panels where directed by OAC and Architect.
8. Each test panel must be clearly labeled, charted, and photographed
9. Contractor shall prepare a written report detailing results of testing including the description of methods employed, materials used and application methods including dwell times, procedures for honing, polishing, and crystallization, and other elements of the test procedure as defined above.
10. Approved test panels will become a part of the Work, and serve as the quality standard for similar type work on the project.
11. Notify the Architect/Engineer seven (7) days in advance of the dates and time when the test panels will be installed.
12. Product manufacturer's representative shall be present when the test panels are being done and when the sample work is being inspected for approval by the Architect/Engineer.

1.5 COORDINATION

A. Coordinate stone floor cleaning with work of other trades and with protection of adjacent. vertical surfaces.
B. Pre-Installation Conference: Conduct conference at Project site.
   1. Review methods and procedures related for interior stone floor restoration, including the following:
      a. Verify masonry-cleaning equipment and facilities needed to make progress and avoid delays.
      b. Materials, material application and sequencing.
      c. Work Plan review.
      d. Coordination with other trades.

1.6 PROJECT CONDITIONS

A. Contractor shall be responsible for protecting all adjacent materials such as plaster, wood, metal, glass, and other adjacent stone not intended to be treated
B. Protect adjacent areas and surfaces not being treated with barriers suitable for the product being used. Appropriate care should be taken at air vents, electrical junction boxes and similar openings that may come in contact with the product.

1.7 CLOSEOUT SUBMITTALS

A. Section 01 78 00 – Operating and Maintenance Data: Submit recommended maintenance methods, cleaning materials, stain removal methods and polishes and sealers.
   1. Include list of liquids detrimental to appearance of stone finish.

1.8 QUALITY ASSURANCE

A. Provide a project supervisor who shall be present at all times during the execution of the work of this section, who shall be thoroughly familiar with the specified requirements, and the materials and methods needed for their execution, and who shall direct all work performed under this section.
B. Provide adequate numbers of workers skilled in the necessary crafts and properly informed of the specialized methods and materials to be used in this work.
C. Use of cleaning products on historic materials should be based on results of test areas in designated locations and working with the technical assistance of the product manufacturers to ensure compatibility with the stone to avoid damage. Adjust concentrations and dwell times according to each stone type and condition.
D. Perform Work in accordance with MIA Handbook Design Manual (latest edition) for instructions applicable to restoration, refinishing, cleaning and maintenance.

E. Contractor shall be responsible for the repair of all damaged adjacent materials due to the execution of the work at no additional expense to the Owner. Repairs shall be made by qualified mechanics skilled in the type of repairs required, to the satisfaction of the owner.

1.9 QUALIFICATIONS

A. Contractor: Work must be performed by a firm having not less than ten (10) years specialized experience in the restoration and cleaning of historic architectural marble, similar to that which is required in this project.
B. The Contractor shall submit references of previous work, documenting the firm's experience. Provide names and contact information for current/previous clients within the last three years. The Architect/Engineer reserves the right to approve or disapprove the use of the Contractor contingent upon their experience and references.

1.10 DELIVERY, STORAGE & HANDLING

A. Section 01 60 00 – Product Requirements: Storage and Protection
B. Deliver materials to site in manufacturer's original and unopened containers and packaging, bearing labels as to type and names of products and manufacturers.

1.11 ENVIRONMENTAL REQUIREMENTS

1. Maintain a minimum of 50 degrees F during application of cleaning materials.

PART 2 - PRODUCTS

2.1 STONE FLOOR RESTORATION

A. Stone Flooring Restorer:
   1. Pinnacle Stone Restoration, Inc., 24702 N. Blue Aster Lane, Lake Barrington, IL 60010, (630) 379-7362; http://www.pinnaclestonecare.com
      a. This preferred refinisher has the requisite skills to accomplish the finish restoration of the historic marble floors, a significant building element.

2.2 MANUFACTURERS

A. PROSOCO, Inc., 3741 Greenway Circle, Lawrence, KS 66046. Phone (800) 255-4255; https://prosoco.com/

2.3 MATERIALS

A. Stone Floor Tile Replacement Units: ASTM C503 Classification; free of defects detrimental to appearance or durability:
   1. Type: Vermont Danby Montclair
   2. Unit Size: 24" x 24" (Verify in field)
   3. Thickness: 1.25 inch thick.
   4. Color: White with black and gray markings
   5. Surface Finish: High honed, but verify with Architect in field to match existing and to determine the level of slip-resistance.
B. Stone Tile Replacement Accent Pieces: C503 Classification; free of defects detrimental to appearane or durability:
   1. Type: Nero Marquina
   2. Unit Size: 3" x 3" (Verify in field) Nero Marquina border strips of various widths and lengths (Verify in field).
   3. Thickness: 0.75"
   4. Color: Black with white markings
   5. Surface Finish: High Honed
C. Honing Compounds: Acid free abrasive compounds of various grits, as required, containing no caustic or harsh fillers or ingredients with natural resins added, manufactured specifically for restorative type wet honing interior marble floor surfaces.

D. Cleaning Agent for Spot Cleaning Stains: Site mixed for removal of built-up stains such as “Sure Klean Marble Poultice” (Prosoco, Inc.).
E. Cleaning Agent for Removing Built-Up Coatings: A non-acidic, gel-like application for removal of built-up coatings and stains using thixotropic alkali with a pH value between 7 and 10, such as “SafStrip 8” (Prosoco, Inc.) or “Sure Klean Fast Acting Stripper” (Prosoco, Inc.).
F. Protective paper film for covering poultices “EnviroKlean Overcoat” (Prosoco, Inc).
G. Masking Agent: Manufacturer’s standard type compatible with cleaning agents for protecting glass, metal, wood and other stone surfaces from damaging effects of cleaner.
H. Water: Potable, non-staining and free of oils, acids, alkalis and organic matter.
I. Impregnating Sealer: water based type suited for application on stones floors of this project and which will not change the color or appearance of the stone or impair vapor transmission thru the stone
J. Miscellaneous Equipment:
    1. Floor Machine - Planetary head type with diamond pads
    2. Hand-held buffing machine for use in corners or other tight areas
    3. Rotary floor buffing machine with pads appropriate for honing, polishing and crystallization
    4. Buffing Pads for Honed Finish: Synthetic pads manufactured specifically for restorative type treatment of honed marble surfaces
    5. Wet/Dry Vacuum
    6. Brushes: natural or synthetic fiber bristles only, solvent resistant type. The use of wire brushes or steel wool is not permitted.
    7. Clean dry cloths
    8. Eye and skin protection
    9. Low pressure sprayer
    10. Sponges

PART 3 - EXECUTION

3.1 WASTE MANAGEMENT
A. Contractor to outline management and disposal for any waste water generated in this work.

3.2 EXAMINATION
A. Perform a thorough examination of the existing stone conditions scheduled for cleaning.

3.3 PREPARATION
A. Vacuum clean dirt, dust and any particulates from the stone floors with a soft bristle tool.
B. Damp clean and verify surfaces are completely clean and dry prior to application of cleaning/stripping agents.
C. Clearly mark or identify the time of application to establish dwell time.
D. Tile replacements and major repairs to be completed by interior cut stone installer prior to floor refinishing.

3.4 INSTALLATION
A. Application of Stripping Compound:
    1. Before applying, read “Preparation” and “Safety Information” sections in the Manufacturer’s Product Data Sheet. Do not dilute or alter.
    2. Apply a thick coating of stripper to dry surface.
    3. Let stripper dwell for 5-10 minutes or until coating “lifts” or shows signs of dissolving. Periodic agitation with a stiff bristle brush improves penetration.

4. Using a low-pressure tank sprayer, apply a mist of water to the treated surface. Water helps emulsify the old sealer and dilute the stripper so residues may be more easily picked up.
5. Using a stiff-bristled brush, scrub the surface until coatings are gone. Add more water to aid scrubbing.
6. Remove waste water as work progresses by wet vacuum. Do not allow water to pond on the floor. Do not pour water down drains.
7. Thoroughly sponge or mop-and-bucket-rinse with clean water. Change the rinse water frequently. If needed, clean surface with appropriate “Sure Klean” masonry cleaner.

B. Spot Cleaning with Clay Poultice:
1. Follow manufacturer’s instructions.
2. Apply the prepared poultice mix to the surface using stainless steel trowel or paste extrusion equipment. Apply a uniform 1/4 inch (6 cm) coating.
3. Cover the poultice with sheets of “Enviro Klean OverCoat”, printed side outward. Rub gently to remove air pockets and ensure smooth overall adhesion. Press the film against poultice. It will cling to the surface. Tape/seal off edges of the film.
4. Leave the covered poultice on the surface 12-24 hours. Test for most effective dwell-time.

C. Removal of Clay Poultice:
1. Follow manufacturer’s instructions.
2. Remove film. If still wet, let poultice dry 2-4 hours. The poultice surface develops cracks as it contracts and dries. A fully developed network of cracks indicates the poultice is completely dry. Dry times vary with environmental conditions such as temperature, wind and humidity.
3. After completely dry, remove the poultice and dissolved staining matter with a non-metallic implement, wood spatula or other suitable scraping device, carefully lifting the paste from the surface. Remove as much residue from the surface as possible.
4. Wash the surface thoroughly with fresh water, using a sponge or cloth. Let surface dry thoroughly.
5. Remove waste water as work progresses by wet vacuum or other appropriate means. Do not allow water to pond on floor.
6. Repeat poultice procedures where necessary.
7. Dry stone surfaces with a soft dry cloth.
8. Use only methods and materials determined during the approved test panel phase. Do not permit cleaning to continue if methods and materials employed results in any permanent damage to surfaces.

D. Cleanup of Clay Poultice:
1. Rinse, brush, roller or sprayer in a pail with water and dish detergent as recommended by manufacturer. Do not pour cleanup water down drains.

E. Diamond Pad Abrasive Wet Honing:
1. Verify stone surfaces are clean, dry, and free of waxes and coatings.
2. Mask or protect adjacent surfaces.
3. Follow manufacturer’s directions for ratio of honing compound to clean water, apply to stone flooring surfaces.
4. Refinish using weighted heavy duty floor machines, planetary head type, with varying diamond pad grades, at speeds recommended by honing compound manufacturer, 175 rpm to <600 rpm. Use hand machines as required in corners and other hard to reach areas.
5. Keep compound wet while buffing. Add water and honing compound as needed.
6. Repair cracks and gouges visible after initial grinding phase.
7. Follow succession of grades of diamond pads and honing compound grit sizes as determined in the approved test panels and as described in the test panel report.
8. Hone marble flooring to 1500 grit to achieve desired high-honed appearance.

9. Insure the stone surface is well rinsed at each changeover of diamond pad grade or grit size.
10. Buff area until approved level of hone finish is achieved matching approved test panel.
11. Rinse well and use a wet vacuum to remove all excess slurry as work proceeds.
12. Protect with a penetrating sealer for long-term durability.

3.5 FINAL CLEANING

A. Clean site of all unused chemical cleaning products, residues, rinse water, and waste generated by this work and in compliance with Work Plan.

B. Remove and dispose of all materials used to protect surrounding areas following completion of work of this section and as per Work Plan.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Carpet, direct glue down installation; no pad.
   1. Carpet Type 1: Friends' Reading Room and Adult Services Room - Over cork subfloor
   2. Carpet Type 2: Reference Annex Room - Over cork subfloor

B. Carpet and pad, double stick glue down installation
   1. Carpet Type 3: Circulation Desk, in Rotunda - Over original marble floor
   2. Carpet Type 4: Business Collection Room - Over concrete slab

C. Removal of existing carpet and pad.

1.2 RELATED REQUIREMENTS

A. Section 01 50 00-Temporary Facilities and Controls: Waste removal and reclamation/recycling of new carpet scrap and removed carpet.

1.3 REFERENCE STANDARDS

A. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials; 2016 (Reapproved 2021).
B. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2025a.
C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.
D. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2023.
E. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.
F. CRI (GL) - Green Label Testing Program - Certified Products; Current Edition.
G. CRI (GLP) - Green Label Plus Testing Program - Certified Products; Current Edition.
H. CRI 104 - Standard for Installation of Commercial Carpet; 2018.

1.4 SUBMITTALS

A. See Section 01 30 00 - 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. Shop Drawings: Indicate seaming plan, method of joining seams, direction of carpet pile and pattern, location of edge moldings and edge bindings.
D. Samples: Submit two samples 24 x 24 inch in size illustrating color and pattern for each carpet type and cushion material specified.
E. Accessory Samples: Submit two 12 inch long samples of edge strip.
F. Sustainable Design Submittal: Submit VOC content documentation for adhesives.
G. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.
H. Manufacturer's Qualification Statement.
I. Installer's Qualification Statement.
J. Operation and Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.
K. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Extra Carpet: 5 lineal yards of each type, color, and pattern installed.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet with minimum five years documented experience.

B. Installer Qualifications: Company specializing in installing carpet with minimum five years documented experience.
   1. FCIB or IFCI certified carpet installers.
C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

1.6 FIELD CONDITIONS
A. Store materials in area of installation for minimum period of 24 hours prior to installation.
B. Maintain minimum 70 degrees F ambient temperature 24 hours prior to, during, and 24 hours after installation.
C. Ventilate installation area during installation and for 72 hours after installation.

1.7 PRE-INSTALLATION MEETINGS
A. Convene minimum one week prior to commencing work in this section.
B. Review methods and procedures related to carpet installation including the following:
   1. Review delivery, storage and handling procedures.
   2. Review ambient conditions and ventilation procedures.
   3. Review subfloor preparation procedures.

PART 2 PRODUCTS

2.1 CARPET
A. Carpet, Type 1 - Stark Carpet Corp.: Woven axminster, wool / nylon.
   1. Critical Radiant Flux: Minimum of 0.22 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
   2. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").
   3. VOC Content: Comply with Section 01 61 16.
   4. VOC Content: Provide CRI (GLP) certified product; in lieu of labeling, independent test report showing compliance is acceptable.
   5. Color: Custom.
   6. Pattern: Custom.
   7. Roll Width: 12.0 or 13.2 ft.
   8. Content: 40% NZ wool / 40% British wool / 20% nylon.
   9. Maximum Electrostatic Charge: 3 Kv. @ 20 percent R.H..
   10. Rows: 9 per inch.
   11. Pitch: 7.
   12. Stitches per inch: 63.
   13. Pile Height: 0.27 inch.
   14. Total Height: 0.39 inch.
   15. Yarn Count: 3-ply.
   16. Pile Weight: 39.2 oz/sq yd.
   17. Floor Radiant Panel: Class 1 (ASTM 648).
   18. Flame Resistance: Pass (ASTM D 2859).
   19. Certifications: ISO 9001, ISO 14001, IMO Module D.
   20. Primary Backing:
      a. Material: Polypropylene.
B. Carpet, Type 2 - Stark Carpet Corp.: Woven axminster, wool / nylon.
   1. Critical Radiant Flux: Minimum of 0.22 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
   2. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").
   3. VOC Content: Comply with Section 01 61 16.

4. VOC Content: Provide CRI (GLP) certified product; in lieu of labeling, independent test report showing compliance is acceptable.
5. Color: Custom.
6. Pattern: Custom.
7. Roll Width: 12.0 or 13.2 ft.
8. Content: 40% NZ wool / 40% British wool / 20% nylon.
9. Maximum Electrostatic Charge: 3 Kv. @ 20 percent R.H..
10. Rows: 9 per inch.
11. Pitch: 7.
12. Stitches per inch: 63.
13. Pile Height: 0.27 inch.
14. Total Height: 0.39 inch.
15. Yarn Count: 3-ply.
16. Pile Weight: 39.2 oz/sq yd.
17. Floor Radiant Panel: Class 1 (ASTM 648).
18. Flame Resistance: Pass (ASTM D 2859).
19. Certifications: ISO 9001, ISO 14001, IMO Module D.
20. Primary Backing:
    a. Material: Polypropylene.

C. Carpet, Type 3 - Stark Carpet Corp.: Woven Axminster wool/nylon, over separate carpet cushion E.
1. Critical Radiant Flux: Minimum of 0.22 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
2. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").
3. VOC Content: Comply with Section 01 61 16.
4. VOC Content: Provide CRI (GLP) certified product; in lieu of labeling, independent test report showing compliance is acceptable.
5. Color: Custom.
6. Pattern: Custom.
7. Roll Width: 12.0 or 13.2 ft.
8. Content: 40% NZ wool / 40% British wool / 20% nylon.
9. Maximum Electrostatic Charge: 3 Kv. @ 20 percent R.H..
10. Rows: 9 per inch.
11. Pitch: 7.
12. Stitches per inch: 63.
13. Pile Height: 0.27 inch.
14. Total Height: 0.39 inch.
15. Yarn Count: 3-ply.
16. Pile Weight: 39.2 oz/sq yd.
17. Floor Radiant Panel: Class 1 (ASTM 648).
18. Flame Resistance: Pass (ASTM D 2859).
19. Certifications: ISO 9001, ISO 14001, IMO Module D.
20. Primary Backing:
    a. Material: Polypropylene.

D. Carpet, Type 4 - TBD: $30 per square yard, for carpet, pad and installation.
1. Critical Radiant Flux: Minimum of 0.22 watts/sq cm, when tested in accordance with ASTM E648 or NFPA 253.
2. Surface Flammability Ignition: Pass ASTM D2859 (the "pill test").
3. VOC Content: Comply with Section 01 61 16.
4. VOC Content: Provide CRI (GLP) certified product; in lieu of labeling, independent test report showing compliance is acceptable.
5. Color: TBD.

6. Pattern: TBD.
7. Roll Width: 12 ft.
8. Content: TBD; Olefin or Polypropylene or Nylon.
9. Maximum Electrostatic Charge: 3 Kv. @ 20 percent R.H..
10. Rows: TBD per inch.
11. Pitch: TBD.
12. Stitches per inch: TBD.
13. Pile Height: TBD inch.
14. Total Height: TBD inch.
15. Yarn Count: TBD-ply.
16. Pile Weight: TBD oz/sq yd.
17. Floor Radiant Panel: Class 1 (ASTM 648).
18. Flame Resistance: Pass (ASTM D 2859).
19. Certifications: ISO 9001, ISO 14001, IMO Module D.
20. Primary Backing:
    a. Material: TBD.

E. Carpet Cushion: Synthetic Rubber Cushion Type; Tred-MOR 2568 Dubl-Stik commercial carpet cushion.
1. Nomninal Thickness: 0.250 inch.
2. Roll Width: 4'-6".
3. Material Weight: 68 oz./sq. yd.
4. Density: 22 lbs./cu.ft.
5. Flame Certification: DOC-FF 1-70, ASTM E662-06, E648; Pill Test: Pass, Smoke Density: Pass.
6. Carpet Cushion: Maximum volatile organic compound content in accordance with CRI Green Label Testing Program.
7. Antimicrobial: Guardian system antimicrobial protection.

2.2 ACCESSORIES

A. Subfloor Filler: Type recommended by carpet manufacturer for infill of existing sheet cork subfloor and concrete slab subfloors.
B. Moldings and Edge Strips: Rubber, black color.
1. Termination Strip: "Tarkett #EG-40-W (Black)"
2. Carpet to Carpet Strip: "Tarkett #VT-40-M6 (Black)"
C. Adhesives:
1. Compatible with materials being adhered; maximum VOC content of 50 g/L.
D. Seam Adhesive: Recommended by carpet manufacturer.
E. Carpet Adhesive: Recommended by carpet manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive carpet.
B. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of adhesives to subfloor surfaces.
C. Verify that required floor-mounted utilities are in correct location.
D. Verify that new desks and other permanent millwork has been installed, with finished wood or stone bases to bring carpet up to.

3.2 PREPARATION

A. Remove existing carpet and protect existing cork subfloor.

B. Replace damaged or missing cork subfloor with new cork to match, adhere per manufacturer's recommended installation.
C. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
D. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler.
E. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.
F. Clean substrate.

3.3 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of subfloor conditions.
B. Install carpet after desks and other permanent millwork has been installed.
C. Install carpet in accordance with manufacturer's instructions and CRI 104 (Commercial).
D. Verify carpet match before cutting to ensure minimal variation between dye lots.
E. Lay out carpet and locate seams in accordance with shop drawings.
    1. Locate seams in area of least traffic, out of areas of pivoting traffic, and parallel to main traffic.
    2. Do not locate seams perpendicular through door openings.
    3. Align run of pile in same direction as anticipated traffic and in same direction on adjacent pieces.
    4. Locate change of color or pattern between rooms under door centerline.
    5. Provide monolithic color, pattern, and texture match within any one area.
    6. Verify carpet stripe/border alignment with existing paneling and window trim, as shown in the Drawings.
F. Install carpet tight and flat on subfloor, well fastened at edges, with a uniform appearance.

3.4 DIRECT-GLUED CARPET

A. Double cut carpet seams, with accurate pattern match. Make cuts straight, true, and unfrayed. Apply seam adhesive to cut edges of woven carpet immediately.
B. Apply contact adhesive to floor uniformly at rate recommended by manufacturer. After sufficient open time, press carpet into adhesive.
C. Apply seam adhesive to the base of the edge glued down. Lay adjoining piece with seam straight, not overlapped or peaked, and free of gaps.
D. Roll with appropriate roller for complete contact of adhesive to carpet backing.
E. Trim carpet neatly at walls and around interruptions.
F. Complete installation of edge strips, concealing exposed edges.

3.5 CLEANING

A. See Section 01 70 00 - Execution and Closeout Requirements for additional requirements.
B. Remove excess adhesive from floor and wall surfaces without damage.
C. Clean and vacuum carpet surfaces.

3.6 CARPET SCHEDULE

A. Carpet Type 1: Stark Carpet Corporation, Custom Axminster, for Friend' Reading Room and Adult Services Room. See Room Finish Schedule in drawings.
B. Carpet Type 2: Stark Carpet Corporation, Custom Axminster. For Reference Annex Room. See Room Finish Schedule in Drawings.
C. Carpet Type 3: Stark Carpet Corporation, Custom Axminster. For Circulation Desk floor, in Rotunda. See Room Finish Schedule in drawings.
D. Carpet Type 4: TBD, for Business Collection.See also Drawings and Room Finish Schedule. See Room Finish Schedule.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surface preparation.
B. Field application of paints.
C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished; Exterior casings and millwork surrounding main entry, including transom window.
D. Do Not Paint or Finish the Following Items:
   1. Items factory-finished unless otherwise 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, bar code labels, and operating parts of equipment.
   5. Stainless steel, anodized aluminum, bronze, terne-coated stainless steel, and lead items.
   6. Marble, granite, slate, and other natural stones.
   7. Floors, unless specifically indicated.
   8. Acoustical materials, unless specifically indicated.
   9. Concealed pipes, ducts, and conduits.

1.2 RELATED REQUIREMENTS

A. Section 05 50 00 - Metal Fabrications: Shop-primed items.

1.3 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; Current Edition.
B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2024.
C. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2020 (Reapproved 2025).
D. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board; 2020.
E. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; Current Edition.
F. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.
G. SCAQMD 1113 - Architectural Coatings; 1977, with Amendment (2016).
H. SSPC V1 (PM1) - Good Painting Practice: Painting Manual Volume 1; 2024.
I. SSPC V2 (PM2) - Systems and Specifications: Steel Structures Painting Manual Volume 2; 2021.
J. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).
K. SSPC-SP 2 - Hand Tool Cleaning; 2024.
L. SSPC-SP 3 - Power Tool Cleaning; 2024.
M. SSPC-SP 6/NACE No.3 - Commercial Blast Cleaning; 2006.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide complete list of products to be used, with the following information for each:
   1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").

2. MPI product number (e.g., MPI #47).
3. Cross-reference to specified paint system products to be used in project; include description of each system.
4. Manufacturer's installation instructions.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating range of colors available for each finishing product specified.
1. Where sheen is specified, submit samples in only that sheen.
2. Where sheen is not specified, submit each color in each sheen available.
3. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens not required.
4. Allow 15 days for approval process, after receipt of complete samples by Architect.
5. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as factory finished metals and wood millwork and paneling, have been approved.

D. Samples: Submit two paper chip samples, 6 x 6 inch in size illustrating range of colors available for each surface finishing product scheduled.

E. Certification: By manufacturer that paints and finishes comply with VOC limits specified.

F. Manufacturer's Instructions: Indicate special surface preparation procedures and substrate conditions requiring special attention.

G. Maintenance Data: Submit finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, and touch-up procedures.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 60 00 - Product Requirements, for additional provisions.
2. Extra Paint and Finish Materials: 1 gal of each color; from the same product run, store where directed.
3. Label each container with color, type, texture, and room locations in addition to the manufacturer's label.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum five years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum five years experience.

1.6 MOCK-UP

A. See Section 01 40 00 - Quality Requirements, for general requirements for mock-up.

B. Provide panel, 4 feet long by 4 feet wide, illustrating paint color, texture, and finish.

C. Locate where directed by Architect.

D. Mock-up may remain as part of the work.

1.7 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.

1.8 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. Do not apply materials when relative humidity exceeds 85 percent, at temperatures less than 5 degrees F above the dew point, or to damp or wet surfaces.
D. Minimum Application Temperatures for Paints: 50 degrees F for interiors unless required otherwise by manufacturer's instructions.
E. Provide lighting level of 80 fc measured mid-height at substrate surface.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.
B. Provide paints and finishes from the same manufacturer to the greatest extent possible.
   1. If a single manufacturer cannot provide specified products; minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for submittals.
C. Paints:
   1. Sherwin-Williams Company: www.sherwin-williams.com.
   2. Fine Paints of Europe: www.finepaintsofeurope.com.
D. Primer Sealers: Same manufacturer as top coats.

2.2 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.
   1. Provide paints and finishes 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 paint material in quantity required to complete entire project's work from a single production run.
   5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
B. Volatile Organic Compound (VOC) Content:
   1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
      a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
      b. SCAQMD 1113 Rule.
      c. CARB (SCM).
      d. Ozone Transport Commission (OTC) Model Rule, Architectural, Industrial, and Maintenance Coatings; www.otcair.org; specifically:
         1) Opaque, Flat: 50 g/L, maximum.
         2) Opaque, Nonflat: 150 g/L, maximum.
         3) Opaque, High Gloss: 250 g/L, maximum.
      e. Architectural coatings VOC limits of the State in which the Project is located.
   2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
C. Flammability: Comply with applicable code for surface burning characteristics.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.
E. Colors: As indicated on drawings.

2.3 PAINT - INTERIOR

A. Wood - Painted:
   1. One coat of primer sealer on all sides of wood member prior to installation
   2. Two coats of semi-gloss enamel
B. Wood Wall Paneling:
   1. See Section 06 03 00-Architectural Woodwork Restoration; No painting
C. Steel - Unprimed:
   1. One coat of primer
   2. Two coats of semi-gloss enamel
D. Steel - Primed:
   1. Touch-up primer
   2. Two coats of semi-gloos enamel
E. Gypsum Board and Plaster Walls:
   1. One coat of latex primer sealer
   2. Two coats of latex eggshell
F. Gypsum Board and Plaster Ceilings:
   1. One coat of latex primer sealer
   2. Two coats of latex flat.
G. Insulated Coverings - Canvas and Cotton:
   1. One coat of latex primer sealer
   2. One coat latex flat

2.4 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
B. Patching Material: Latex filler.
C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been adequately prepared.
B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
D. If substrate preparation is the responsibility of another installer, notify 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 is below the following maximums:
   1. Gypsum Wallboard: 12 percent.
   2. Plaster and Stucco: 12 percent.
   3. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
   4. Interior Wood: 15 percent, measured in accordance with ASTM D4442.
   5. Concrete Floors and Traffic Surfaces: 8 percent.

3.2 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
C. Remove or repair existing paints or finishes 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 or tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
G. Acoustical Plaster Ceilings - Section 09 22 00: Do NOT paint acoustic ceilings!
H. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.
I. Plaster: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high-alkali surfaces.
J. Aluminum: Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.
K. Ferrous Metal:
    1. Solvent clean according to SSPC-SP 1.
    2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces.
    3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer.
L. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

3.3 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
B. Apply products in accordance with manufacturer's written instructions.
C. Where adjacent sealant is to be painted, do not apply finish coats until sealant is applied.
D. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
E. Apply each coat to uniform appearance in thicknesses specified by manufacturer.
F. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.
G. Sand wood and metal surfaces lightly between coats to achieve required finish.
H. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
I. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection.

3.5 CLEANING

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

3.6 PROTECTION

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

3.7 COLOR SCHEDULE

A. Exterior Door Trim
   1. Color: Oil paint to match SW 7563 "Restful White", High Gloss .

B. Vestibule
   1. Walls: SW 7516 "Kestrel White", Eggshell .
   2. Door Frame and Transom Surrounds: SW 7563 "Restful White", Semi-Gloss .
   3. Ceiling SW 6371 "Vanillin", Flat .
   4. Cornice: SW 7516 "Kestrel White", Satin.

C. Foyer
   1. Walls: SW 7516 "Kestrel White", Eggshell .
   2. Ceiling: NO PAINT
   3. Ceiling inside medallion: SW 6371 "Vanillin", Flat.
   4. Ceiling strip between Cornice and Acoustic Plaster: SW 7662 "Evening Shadow", Flat.
   5. Door Frame and Transom: SW 7563 "Restful White", Semi-Gloss.
   6. Windows/Courtyard Doors: SW 7563 "Restful White", Semi-Gloss.
   7. Cornice: SW 7563 "Restful White", Satin.
   8. Medallion Trim: SW 7563 "Restful White", Satin.

D. Rotunda
   1. Wall Pilasters: Blackish Green to match exist., Satin.
   2. Bookcases: Blackish Green to match exist., Satin.
   3. Shelves: Blackish Green to match exist., Semi-Gloss.
   4. Portal Surrounds: SW 7563 "Restful White", Satin.
   5. 5. Door Jambs: SW 7563 "Restful White", Satin.
   6. "Archer" Relief Surround: SW 7563 "Restful White", Satin.
   7. Cornice/Entablature: Darkish Green to match exist., Satin.
   8. Ceiling Vertical Portion only above Cove: SW 7662 "Evening Shadow", Flat.
   9. Ceiling: Acoustic Plaster - DO NOT PAINT.
   10. Light Well Surround: SW 6258 "Tricorn Black", Satin.

E. Friends Reading Room
   1. Ceiling Field: SW 7516 "Kestrel White", Flat .
   2. Ceiling stepped banding: SW 7516 "Kestrel White", Satin .
   3. End Wall Lunettes: SW 7516 "Kestrel White", Eggshell.

F. Adult Services
   1. Ceiling Field: SW 7676 "Paper Lantern", Flat.
   2. Ceiling Stepped Bands: SW 7676 "Paper Lantern", Satin.
   3. End Wall Lunettes: SW 7518 "Beach House", Eggshell.

G. Reference Annex
   1. Ceiling Field: Acoustic Plaster - DO NOT PAINT
   2. Ceiling Strip between Cornice and Acoustic Plaster: SW 7676 "Paper Lantern", Flat.
   3. Ceiling Stepped Elements: SW 6371 "Vanillin", Satin.
   4. Cornice: SW 7676 "Paper Lantern", Satin.
   5. Walls: SW 6371 "Vanillin", Eggshell.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

A. Work under this Section shall consist of fabrication and installation of new wayfinding signage for the Lake Forest Library.

B. Work under this Section consists of furnishing everything necessary for and incidental to the execution and completion of the wayfinding signs.

1.02 DESCRIPTION OF WORK

A. The Work shown in the Drawings shall be installed as part of the Work for the Lake Forest Library in Lake Forest, Illinois.

B. Wayfinding Sign Types – The following is an overview list of the wayfinding sign types (the signs) included in this Section for the Lake Forest Library Project:

1. Sign Type C-1 Identification (Bookshelf Insert Header)
2. Sign Type DIR-1 Directional (Text)
3. Sign Type DIR-2 Directional (Symbols)
4. Sign Type L-1 Room Identification (Primary Rooms, overhead)
5. Sign Type L-2 Room Identification (Adult Services, above doorways)
6. Sign Type L-3 Entry Door Hours Information
7. Sign Type T-1 Room Identification (Placed on Desktop)
8. Sign Type W-1.4 No Entry
9. Sign Type W-2 Directory (Postings)

C. Fabrication or location of the wayfinding signs or wayfinding sign components is not allowed until the Issue For Construction documents have been signed, sealed, and released by the Architect and the Final Issue for Construction Wayfinding Signage Message Schedule has been released by the Library and the Architect.

D. In addition to review and acceptance of Product Data and Shop Drawings, review and acceptance of all Color Samples, Material Samples, Sign Face Layouts, Mock-ups, Prototypes, and Proofs is required prior to fabrication.

E. The Work is as shown in the Drawings and as specified herein and includes, but is not limited to, the following:

1. Provide complete fabrication and installation of new interior wayfinding signs, wayfinding sign panels, letters and components with message copy and symbols, including all fabrication and installation.
2. Provide Review Drawings, Shop Drawings, Working Drawings, As-Built Drawings, and incidentals.
3. Provide all required Samples, Submittals, Proofs, Mock-ups, and Prototypes.
4. Provide all the materials, fasteners, hardware, adhesives, structures, brackets, and all other mounting, and anchoring hardware necessary for the fabrication and installation of the wayfinding signs.
5. Provide all required color, finish, material, and process matching for all the wayfinding signs.
6. Prepare digital art and reproduction ready files as required. Assemble messages

and prepare required art for production of sign graphics. Provide all required digital file preparation.

7. Provide restoration of finishes, surfaces, pavements, landscaping, and all other site and building conditions, finishes, and/or features that are affected by the installation of the wayfinding signs.

8. Acquire all necessary reviews, licenses, permits, permissions, and approvals. Provide written documentation to the Library and the Architect verifying that all the required licenses, permits, and permissions have been properly obtained.

1.03 REFERENCE STANDARDS

A. Where more stringent requirements than those described in the Drawings and the Specifications are set forth under codes, laws, rules, regulations, and ordinances of federal, state, county, and any local governing bodies, regulatory agencies, authorities, and any other entities having jurisdiction, notify the Library in writing before proceeding with Work. Work is subject to the applicable portions of the following standards:

1. All signage to comply with all applicable specifications, guidelines, regulations, and requirements of the Americans with Disabilities Act (ADA), the 2010 ADA Standards for Accessible Design, and the Illinois Accessibility Code.

2. All applicable rules and regulations of the Occupational Safety and Health Administration (OSHA).

1.04 INTENT OF THE PLANS AND SPECIFICATIONS

A. Do not manufacture, reproduce, or exhibit the Drawings, or modify them for any other purpose outside of this current Contract, without written approval of the Library and the Architect.

B. The Drawings show design intent only. The Drawings do not cover every detail of materials, parts, fabrication, construction, mounting, and installation. Furnish all required site reviews, inspections, testing, engineering, materials, parts, fabrication, finishing, construction, mounting, and installation necessary to properly complete the entire Work in compliance with the design intent, whether or not said details are shown or specified, at no additional cost to the Library.

C. Wayfinding Sign Locations

1. The wayfinding sign locations shown in the Drawings are for general reference only and are not representative of the exact final locations.

2. The final locations for the wayfinding signs shall be established on-site.

D. The wayfinding sign message examples shown in the Drawings are for reference only. The actual messages for the wayfinding signs shall be provided in the Final Issue for Construction Wayfinding Signage Message Schedule.

1.05 PROJECT/SITE CONDITIONS

A. Provide all on-site inspections, surveys, and testing required to properly, safely, and securely install the wayfinding signs.

B. Prior to the start of any fabrication, examine the conditions at each of the wayfinding sign locations on-site.

1. Examine the overall site conditions.

2. Verify the site dimensions at each of the wayfinding sign installation locations. Provide the Library and the Architect with on-site dimensions for the locations and items indicated in the Drawings.

C. Installation of the wayfinding signs shall not damage surfaces or structural elements at any of the sign installation locations.

D. Include on-site dimensions in the Shop Drawings.

1.06 COORDINATION

A. Coordinate the wayfinding signage with other aspects of the Project as required.

B. Before the start of the Work, verify the overall Project Schedule with the Library. Coordinate the wayfinding signage fabrication, installation, and all other Work for the wayfinding signs with the overall Project Schedule. Provide the Library and the Architect with complete schedule information for the fabrication, installation, and all other Work for the wayfinding signs. At a minimum, indicate dates for the review of on-site conditions, Mock-up and Prototype Sign review dates, start and end dates for fabrication, and start and end dates for installation.

C. Coordinate with the Library to schedule all site visits, deliveries, installations, and other on-site activities. Coordinate and schedule all Work, deliveries, and installation activities so that Project operations and activities are not disrupted.

D. Coordinate the wayfinding signage with other Project components and packages as required. Other Project packages include, but are not limited to, the Architectural, Structural, Civil, Mechanical, and Electrical packages.

E. Coordinate the wayfinding signage with the overall Project schedule so that wayfinding sign components that are to be covered by building finishes, pavement, landscaping, or that are to be otherwise concealed, are installed prior to the installation of the final, finished surfaces or materials and do not disrupt the overall Project workflow.

1.07 DELIVERY AND PROTECTION

A. Before delivery to the site, each wayfinding sign shall be tagged or labeled with its identifying number and installation location as shown in the Drawings. Labeling shall be both on the wayfinding sign and the protective covering. Labels with identifying numbers or installation location numbers shall be hidden when the wayfinding sign is installed (unless otherwise specified) or shall be removed without damage to the sign at the time of installation.

B. Finished surfaces shall be adequately protected during all phases of the Work to prevent damage by scratches, stains, discoloration, or other causes. Correct all damage made to wayfinding signs during fabrication, handling, shipment, storage, and installation.

C. Receive all wayfinding signage deliveries. Arrange with the Library to provide adequate, secure, locked storage for wayfinding signs that have been delivered to the site but not yet installed. If adequate storage space is not available, coordinate delivery of the signs to coincide with installation.

D. Wherever installed wayfinding signs are exposed to possible damage from ongoing construction, install protective barriers or other measures so as to protect the wayfinding signs from becoming dirty, dusty, or damaged.

1.08 QUALITY CONTROL

A. Work under this Section shall be done by skilled workers that have been especially trained, and if applicable, properly licensed, to perform the work required and that have successful experience working on projects of comparable scope, size, and complexity.

B. Provide the supervision and coordination required to insure that the wayfinding signs shall be supplied per the Library’s and the Architect’s requirements.

C. Upon request, provide evidence to the Library that demonstrates compliance with the requirements for Quality Control as specified herein.

1.09 WARRANTY/CORRECTION OF WORK

A. Warranties listed below are in addition to, and not a limitation of, other rights the Library may have under the Contract Documents.

B. Provide the Library with documentation of the manufacturer's warranties for all products supplied as part of this Work.

C. All fastening devices and adhesives must be durable, suitable for long-term use in exposed exterior locations, vandal-resistant, vibration-resistant, and tamper-resistant. All fastening devices must be corrosion-resistant. All fastening devices and adhesives must be warranted as to permanency of performance.

D. Warrant to the Library in writing that the materials and equipment furnished under the Contract will be of high quality and new unless otherwise required or permitted in writing by the Library, that the Work will conform with the requirements of the Contract Documents, and the Work will be free of defects not inherent in the quality required or permitted in writing by the Library. Work not conforming to these requirements, including unauthorized substitutions, may be considered defective. If required by the Library, furnish satisfactory evidence as to the kind and quality of materials and equipment.

E. Warrant to the Library in writing that the paint finishes, the protective clearcoat finishes, inkjet printing inks, and the silkscreen printing inks furnished under the Contract will be of high quality, free of defects in appearance or application, will not develop excessive fading or excessive non-uniformity of color, and will not yellow, crack, peel, or otherwise fail as a result of defects in materials or workmanship, for a period of at least seven (7) years beginning upon final acceptance of the Work by the Library.

F. Warrant to the Library in writing that all the signs furnished under the Contract will be high-quality, free of defects in appearance, and will not corrode, or otherwise fail as a result of defects in materials or workmanship, for a period of at least three (3) years beginning upon final acceptance of the work by the Library.

G. Remove from the site and properly dispose of, at no additional cost to the Library, portions of the Work which are defective, not in accordance with the requirements of the Contract Documents, or not accepted by the Library.

1.10 MAINTENANCE AND SAFETY INSPECTION INSTRUCTIONS

A. Provide complete and detailed maintenance and safety inspection instructions to the Library and the Architect. Provide detailed information and instructions on the proper operation, maintenance, and safety inspection procedures for all wayfinding sign types installed under this Contract. Provide three (3) printed copies and one (1) digital copy of the maintenance and safety inspection instructions to the Library. Provide one (1) printed copy and one (1) digital copy of the maintenance and safety inspection instructions to the Architect. Digital copies shall be provided on CD or on a USB flash drive as .pdf files.

1.11 SAMPLES AND SUBMITTALS

A. Provide Samples and Submittals as specified herein and in accordance with the Division 01 General Requirements.

B. Provide the Library and the Architect with a Submittal Schedule. At a minimum, list all Submittals, their content, the planned submission dates, and the review period for each Submittal. Include anticipated dates for the review of the Prototype Signs. All Samples and Submittals shall be made with such promptness as to cause no delay in the Work. Schedule the Work so that the Library and the Architect each have a minimum of ten (10) working days to review each Submittal, excluding shipping time, and without overlap.

C. The Library and the Architect will review all the Samples and Submittals for general conformance with the design intent of the Project. Work undertaken prior to receipt of written acceptance of the Samples and Submittals, shall, based upon the acceptance or rejection of the Samples and Submittals, be corrected at no cost to the Library. All notifications of acceptance or rejection shall be made in writing. All materials furnished for the Project must be as represented by the accepted Samples and Submittals.

D. Reproduction of any portion of the Drawings provided for use in Submittals or Shop Drawings is unacceptable. Such Submittals will be returned unreviewed.

E. Product Data

1. Submit manufacturer's technical data, descriptive literature, specifications, preparation and installation instructions, operating instructions, storage instructions, handling and maintenance instructions for all the materials, components, and applied finishes used for the Work.

2. Provide structural, physical, and environmental characteristics, size limitations, special handling, and/or special installation requirements for all materials.

3. Provide any special precautions or instructions required.

4. Samples may be submitted in lieu of literature if approved by the Library.

F. Shop Drawings

1. Fabricate only from Shop Drawings that have been reviewed and accepted by the Library and the Architect. Prior to submission, verify submittal and resubmittal formats, quantities, and procedures with the Library.

2. Prior to the start of fabrication, submit complete and detailed Shop Drawings for all wayfinding sign types and all wayfinding sign components.

3. Show all wayfinding sign fabrication, assembly, and mounting methods. Show all materials, hardware, dimensions, and details.

4. Provide final sign location plans as part of the Shop Drawing submittals. Show all the final sign locations and the correct sign face orientations and positions on the final sign location plans.

5. If the submitted Shop Drawings show variations from the Contract requirements, make specific reference to such variations on the Shop Drawings and in the letter of transmittal with a request for acceptance. Substitutions and modifications shall be made only when accepted in writing by the Library and the Architect.

G. Submit Samples of all the materials, finishes and hardware. Submit Samples of all the fonts, alphabets, symbols, arrows, and logos used on the wayfinding signs for review and acceptance by the Library and the Architect prior to preparing sign face layouts.

H. The wayfinding signs have custom letter spacing as indicated in the Drawings. Submit several examples of actual sign messages showing the custom letter spacing to the Library and the Architect for review and acceptance prior to preparing sign face layouts.

I. Symbols shown in the Drawings are for reference only and are not for reproduction. Digital art files for all symbols shall be supplied by the Library.

J. Wayfinding Sign Face Layouts for Review by the Library and the Architect

1. Provide dimensioned wayfinding sign face layouts for review by the Library and the Architect for all wayfinding sign types and all wayfinding sign locations.

2. The sign face layouts shall show the final wayfinding sign messages and graphics. Show the correct custom letter spacing and the custom word spacing

on the sign face layouts.

3. Layouts will be reviewed for content, accuracy of alignments, typeface, type weight, letter spacing, word spacing, symbol quality, quality of reproduction, and conformance with the design intent. Sign face layouts shall not be reviewed for color.

4. All Work shall be expected to conform to the quality of letterform, spacing, and acuity of the accepted layouts.

K. Color Samples

1. Submit samples of all the colors as specified herein.

2. Show each of the colors, in each of the reproduction methods and materials, and on each of the substrates used.

3. Show all the colors with the correct finishes. Show the paint colors, silkscreen colors, and inks with the correct clearcoats and at the correct gloss levels.

L. Samples and Submittals shall be made in accordance with the General Conditions. For each Sample and Submittal, provide the quantity required by the Library plus one copy or example that will be retained by the Architect. Samples and Submittals shall be of adequate size showing quality, type, color range, finish, texture, etc. Deliver Samples and Submittals in a timely manner, in excellent condition, and freight prepaid.

1.12 PROTOTYPE SIGNS

A. Prior to commencing fabrication of the final wayfinding signs, provide one (1) complete example of each of the following Sign Types for review by the Library and the Architect as Prototype Signs.

1.	Sign Type C-1	Identification (Bookshelf Insert Header)
2.	Sign Type DIR-1	Directional (Text)
3.	Sign Type DIR-2	Directional (Symbols)
4.	Sign Type L-1	Room Identification (Primary Rooms, overhead)
5.	Sign Type L-2	Room Identification (Adult Services, above doorways)
6.	Sign Type L-3	Entry Door Hours Information
7.	Sign Type T-1	Room Identification (Placed on Desktop)
8.	Sign Type W-1.4	No Entry
9.	Sign Type W-2	Directory (Postings)

B. The Prototype Signs shall be complete and full size. The Prototype Signs shall utilize the same materials and fabrication and installation methods that are intended for the final signs. The Prototype Signs shall include all the components of the actual signs, including mounting hardware, materials, and methods.

C. The Prototype Signs shall be reviewed on a date and at a location acceptable to the Library and the Architect. Provide the Library and the Architect with a minimum of thirty (30) days notice prior to the review of the Prototype Signs.

D. The Prototype Signs shall be reviewed by the Library and the Architect. Prepare and submit to the Library and the Architect a written summary of the review documenting any adjustments or changes made to the Prototype Signs during the review. Any necessary adjustments or changes will be made prior to commencing fabrication of the final signs. Replace unsatisfactory items as directed. When accepted, the Prototype Signs shall

serve as the standard for materials, workmanship, and appearance throughout the Project.

E. Once accepted, the Prototype Signs shall be fully installed in their proper locations.

F. Provide proper packaging, crating, and shipping of the Prototype Signs. Ship the Prototype Signs to and from the review location.

PART 2 PRODUCTS

2.01 MATERIALS AND MANUFACTURERS

A. Source Quality Control

1. Obtain primary materials from a single manufacturer.
2. Provide secondary materials only as recommended by the manufacturer of the primary materials.
3. Do not change source or brands of materials during fabrication.

B. Acrylic Sheet

1. Provide scratch resistant and UV resistant clear, clear non-glare, and translucent acrylic sheets as required.
2. Unless otherwise indicated in the Drawings, determine the thickness of material required, subject to review by the Library and the Architect.

C. Polycarbonate Sheet

1. Lexan SG100 Sheet, GE Structured Plastics Lexan Polycarbonate Sheet, or Makrolon Polycarbonate, Bayer MaterialScience.
2. Sheet shall be clear or translucent as shown on the Drawings. Unless otherwise indicated in the Drawings, determine the thickness of material required, subject to review by the Library and the Architect.

D. Graphic Films and Sheeting

1. Carefully prepare all substrates to receive graphic films and sheeting per the appropriate manufacturer’s specifications.
2. Follow all of the applicable manufacturer’s guidelines and specifications for production, cutting, and application of all graphic films and sheeting.
3. Maintain all product warranties.
4. All graphics produced using graphic films and sheeting must be durable and long lasting. Use production and application techniques as recommended by the film and sheeting manufacturer to produce high quality graphics with the longest possible life expectancy.
5. Provide clear, protective overlaminates for Sign Types as indicated in the Drawings. Overlaminates shall be vandal-resistant, UV-resistant, and compatible with the surfaces and finishes to which the overlaminates are applied.
6. Opaque vinyl graphics shall be produced using cast vinyl graphic film, electronic cuttable, 2-mil (2.5 to 3.5 mils with adhesive), pressure-sensitive with a tensile strength of 5 lbs/in at 73 degrees F, applied film shrinkage not greater than 0.010 inch maximum, and permanent.
7. Graphic Films for Double-Sided Window Graphics

a. Provide all films and high-resolution digital printing required for double-sided window graphics.

b. Window graphics shall be completely opaque. Lettering, colors, or images shall not show through from one side of the graphic to the other, even when the graphic is viewed in direct sunlight.

c. Graphics shall be digitally printed, at high-resolution, using UV-resistant inks. Right reading graphics shall be printed on the face/non-adhesive side of a high-performance 6 mil gloss white opaque block-out film with a white pigment adhesive. Reverse printed graphics (to be read through the glass) shall be printed on the face/non-adhesive side of a high-performance 3 mil clear adhesive film that is compatible with the block-out film. The block-out film shall be carefully registered with and cleanly adhered to the clear adhesive film to create the double-sided window graphic. There shall not be any dust, dirt, air bubbles, or any other imperfections or irregularities trapped between the block-out film and the clear adhesive film. The adhesive side of the clear film is used to securely adhere the completed double-side graphic to glass in the locations indicated in the Drawings.

d. Double-sided window graphics, intended to be read from the building exterior, shall be mounted to the interior surface of the building glass.

8. Acceptable graphic film and sheeting manufacturers:

a. 3M
b. Avery Dennison
c. Nippon Carbide

E. Paint

1. Paint shall be a high quality, exterior grade, acrylic polyurethane, specially formulated for use on signage.

2. Unless otherwise indicated in the Drawings, paint on the exterior surfaces of the wayfinding signs shall have a non-glare finish. The non-glare finish shall conform to all applicable ADA guidelines and requirements.

3. Provide all required primers and finish topcoat paints to match the colors and to provide the performance as herein specified. Primers shall be formulated to be compatible with the surfaces to which they shall be applied and with the finish topcoat paints. Primers and finish topcoat paints shall be manufactured by the same company.

4. All painted finishes shall have a UV inhibiting protective clearcoat. The clearcoat shall have a non-glare finish. The non-glare finish shall conform to all applicable ADA guidelines and requirements. The UV inhibiting protective clearcoat and the color coat paint beneath shall be manufactured by the same company. The UV inhibiting protective clearcoat shall be formulated to be compatible with the finishes, colors, and substrates underneath.

5. Acceptable paint manufacturers include:

a. Matthews Paint
b. Akzo Nobel
c. Spraylat

F. Colors

1. See the Drawings for additional color specification information.

2. The surfaces of the wayfinding signs, wayfinding sign components, letters, symbols, logos, structural components, and elements shall be finished as indicated in the Drawings. Match the colors specified.

3. Colors are indicated in the Drawings for application using the paint, ink, coating, or material specified. Submit appropriate Samples for review and acceptance in each of the colors, in each of the materials/finishes/coatings, and on each of the substrates specified.

4. Indicate all color breaks and descriptions of all the materials and methods used to produce each of the colors in the Shop Drawings.

G. Lettering Style

1. Provide all the required fonts. The Library and the Architect shall not provide any fonts.

2. Letter weight (Medium, Bold, etc.), style (Roman, Italic), and spacing shall match the Drawings. Legends shall include letters, numbers, arrows, symbols, logos, graphics, borders, characters, typography, and other applications shown for wayfinding sign panels. Enlargement or reduction of artwork applications shall be done photographically or digitally. Hand cut masks or templates will not be accepted.

3. Wayfinding sign lettering shall be executed in such a manner that all the edges and corners of the letterforms and symbols are true, clean, and photographically precise. All letterforms and symbols must be accurately reproduced.

H. Symbols

1. Symbols, logos, and logotypes shown in the Drawings are for reference only.

2. Symbols, logos, and logotypes shall match standards as shown in the Drawings. Digital art for all symbols, logos, and logotypes shall be supplied by the Library.

3. Symbols and logos shall be executed in such a manner that all edges and corners are true, clean, and photographically precise. All symbols and logos must be accurately reproduced.

I. Adhesives

1. Provide high quality, high-strength, high-performance, permanent adhesives as required. Adhesives shall be suitable for the components being adhered and the locations where the components are to be mounted or installed.

2. Adhesives shall not react with surface finishes.

J. Wayfinding Signs with Raised Characters, Raised Graphics, and Braille

1. Wayfinding signs with raised characters, raised graphics, and Braille shall conform to all ADA specifications, guidelines, regulations, and requirements indicated for materials, thickness, finish, colors, designs, shapes, sizes, and details of construction. Installed dimensional tolerances shall be plus/minus 1/16 of an inch (1/16").

2. The wayfinding signs with raised characters, raised graphics, and Braille shall be produced using 1/8-inch (1/8") thick painted plexi with painted 3D printed raised letters and symbol. The plexi material shall be as best suited to furnish the finish and strength required to conform to all ADA specifications, guidelines, regulations, and requirements.

3. The faces of the wayfinding signs with raised characters, raised graphics, and Braille shall have painted backgrounds and contrasting copy and graphics.

4. Raised characters and raised graphics shall be relieved 1/32-inch (1/32") minimum from the plaque first surface by the manufacturer's photomechanical stratification process. Precisely formed, uniformly indicated for size, style, spacing, content, position, and color. Flat faces of raised characters and graphics shall be evenly and opaquely colored using silkscreen tipping with enamel ink suitable for printing on the sign face material and finish.

5. Braille shall conform to all relevant ADA specifications, guidelines, regulations and requirements indicated for size, style, shape, spacing, content, position, and color. Braille shall be Grade 2. Dimensions for Braille shown on the Drawings are approximate and are for placement only. Translate the sign copy to appear in Braille.

6. Materials and finishes for all wayfinding signs with raised characters, raised graphics, and Braille shall be suitable for use in either interior or exterior locations. The signs shall have an appropriately formulated, protective, UV-resistant, non-glare clearcoat. The non-glare clearcoat shall conform to all applicable ADA guidelines and requirements. Sign finishes shall conform to all ADA specifications, guidelines, regulations, and requirements for gloss level. There shall be no sharp or rough edges on the signs.

7. Wayfinding signs with raised characters, raised graphics, and Braille shall be safely, permanently, properly, and securely mounted to interior and exterior walls without visible fasteners. Each sign shall have an acrylic mounting/backer panel. Sign panels shall be safely, properly, permanently, and securely adhered to the backer panels with appropriate, high-strength, exterior grade double-coated adhesive. Each backer panel shall be safely, properly, permanently, and securely mounted to the wall with appropriate, high-strength, exterior grade double-coated VHB tape and silicone adhesive. Provide mechanical fasteners and anchors, mounting pins, and other appropriate mounting hardware and materials as required to safely securely, and properly mount the signs.

K. Directories

1. Directories shall be vandal-resistant while also allowing messages strips to be removed and replaced for updates and maintenance.

2. There shall be no hardware visible on the face of the directories. Sheet inserts shall be properly aligned and securely held in position by a concealed aluminum back plate. This back plate shall have clear inserts, or a similar concealed attachment system, that shall allow sheets (8 ½" x x11") to be individually inserted or removed without disassembling the entire sign (but by opening the lockable glass doors).

3. The directories shall be vandal-resistant and corrosion-resistant. The materials and hardware used must be durable and suitable for long-term use in exposed exterior locations.

2.02 FABRICATION – GENERAL

A. All wayfinding signs shall be structurally sound and carefully fabricated using high quality materials and quality craftsmanship. Wayfinding sign parts and components shall be carefully, properly, securely, and safely assembled and attached. All wayfinding signs and wayfinding sign components shall be carefully, securely, properly, and safely mounted and installed.

B. All wayfinding signs shall be fabricated to have a neat and clean appearance. All wayfinding signs shall be rigid and structurally sound.

C. Wayfinding sign materials, designs, sizes, and finishes shall be as shown on Drawings

and herein specified. Thickness of the materials shall be adequate for the size of the sign. Finishes shall be as shown in the Drawings.

D. Carefully and properly prepare all surfaces and materials that are to be adhered in strict accordance with the adhesive manufacturer's instructions. Carefully follow the adhesive manufacturer's preparation and application instructions.

E. Unless indicated otherwise, prepare all art for the wayfinding sign graphics.

1. All artwork shall be enlarged photographically or digitally to match the sizes and placement as shown in the Drawings.

2. Provide all file preparation required.

3. Assemble legends, messages, symbols, and logos; prepare digital art files, and prepare digital art files for production.

4. Provide copies of all the digital art files prepared for the Project to the Library upon completion and before final acceptance of the Work. Provide each of the files both as native files in the software used to create the files and as .pdf files.

F. All wayfinding sign faces and returns shall be flat, precise, rigid, smooth, true, and free of saw marks, chips, burrs, discoloration, irregularities, "oil-canning" and other defects. Edges and corners shall be precise, smooth, true, and free of saw marks, chips, burrs, discoloration, irregularities, and other defects. Corners shall be eased. There shall be no sharp or rough edges, no sharp or rough corners, and no sharp or rough projections anywhere on the wayfinding signs. Seams shall have hairline contact. Wayfinding sign faces shall be of sufficient thickness so that hardware or materials mounted to or attached to the backs of the sign faces shall not distort or discolor the fronts of the sign faces or otherwise detract from the smoothness and appearance of the sign faces. Joints shall be undetectable and completely and permanently sealed. There shall be no visible hardware on the wayfinding sign faces unless indicated in the Drawings. Unless other wise indicated in the Drawings, visible hardware shall be finished to match the surrounding material.

G. Maintain correct message order. Correct message order shall be shown in the Shop Drawings.

2.03 FABRICATION – ADDITIONAL REQUIREMENTS

A. Non-illuminated Sign Types

1. Non-illuminated wayfinding signs and sign cabinets shall be fabricated from the materials indicated in the Drawings. Thickness of the materials shall be adequate for the size of the sign or sign cabinet. Finishes shall be as shown in the Drawings.

2. The non-illuminated wayfinding signs and sign cabinets shall be fabricated so that their corners shall be smooth, free from defects, burrs, and discoloration. Faces, edges, and returns shall be flat, smooth, and free from irregularities and defects. Joints shall be undetectable and completely and permanently sealed.

3. Sign faces for non-illuminated wayfinding signs shall be fabricated using the materials and finishes indicated in the Drawings. The faces shall be flat, smooth, and free from irregularities and defects. Graphics shall be properly applied using the materials and finishes indicated in the Drawings. Sign faces shall be safely, securely, and properly mounted to the sign cabinets. There shall be no visible hardware on the sign faces.

4. Provide durable, corrosion-resistant internal framing for the non-illuminated wayfinding sign cabinets as required for the cabinets to be rigid and structurally sound and to safely, securely, and properly support the sign faces and all

components mounted to the non-illuminated wayfinding sign cabinets. Provide all internal framing as required for the cabinets to be safely, securely, and properly mounted.

5. Non-illuminated wayfinding sign cabinets shall be safely, securely and permanently mounted. Provide all the appropriate mounting components, hardware, materials, and methods required. There shall be no visible hardware.

B. Non-illuminated Cut-out Letters, Symbols, and Logos

1. Non-illuminated cut-out letters, symbols and logos shall be the materials and thicknesses as indicated on the Drawings.

2. The letterforms, symbols, and logos shall be cut out so that their proportions and details are accurately and precisely reproduced.

3. Non-illuminated cut-out letters, symbols and logos shall be properly, safely, securely, and permanently pin mounted flush to the mounting surface, as indicated in the Drawings, using appropriate hardware, materials, and methods. There shall be no visible hardware.

C. Insert Graphics

1. Provide insert graphics as indicated in the Drawings.

2. Provide all file preparation and digital printing required. Content information for insert graphics shall be provided by the Library. Assemble legends, messages, symbols, and logos; prepare digital art files, and prepare digital art files for production.

3. Insert graphics shall be printed at high resolution on durable, long lasting, readily available, UV-resistant substrates using UV-resistant inks, or other durable, UV-resistant reproduction methods accepted by the Library and the Architect. Indicate the materials and reproduction methods to be used on the Shop Drawings for review and acceptance by the Library and the Architect.

4. Provide non-glare, scratch-resistant, and vandal-resistant insert windows and holders for the insert graphics as indicated in the Drawings. Insert windows and holders must securely hold the insert graphics in position, protect the graphics from vandalism, and also allow the graphics to be easily changed and updated by authorized personnel. The insert windows and holders shall not have visible hardware. Provide detailed information on the fabrication of the insert windows and holders in the Shop Drawings for review and acceptance by the Library and the Architect.

D. Digital Printing

1. Provide high-resolution, high-quality digital printing.

2. All digital printing shall be high-resolution, using durable, vandal-resistant and UV-resistant inks.

3. Coordinate printing method and ink type with the substrate materials. Provide white printing capability as required.

2.04 PAINTING AND FINISHING

A. All wayfinding sign finishes, coatings, inks, and graphic reproduction methods shall be durable, exterior grade, UV-resistant, and vandal-resistant. Provide Product Data and information on all the primers, finishes, coatings, paints, inks, and graphic reproduction methods to be used for review by the Library and the Architect. Paint and clearcoat gloss levels shall be as indicated in the Drawings and specified herein.

B. Lines where different paint colors meet shall be even, clean, and sharp. Colors shall not bleed or run into each other. There shall not be a level change from one paint color to the other.

C. Finish all wayfinding sign components to protect them from corrosion with materials and finishes as appropriate for the component, its location, and its visibility. Indicate all finishes to be used in the Shop Drawings.

D. Thoroughly clean and properly prepare all surfaces to be finished in strict accordance with the finish manufacturer's instructions. Follow the paint manufacturer's instructions to properly clean and prepare surfaces to be painted. Remove all dust, dirt, foreign materials, waxes, grease, silicones, and other contaminants from the surfaces to be finished following the manufacturer's recommendations.

E. Provisions should be made for proper handling at all stages of the priming, painting, shipping, storing, erection, and installation for protection of primed and/or painted surfaces from damage or soiling.

F. The paint topcoat shall be applied in strict accordance with the manufacturers' published technical bulletins, procedures, and instructions.

1. Paint shall be applied in the shop as much as possible.

2. Apply paint topcoat over compatible primer. Apply paint topcoat to achieve the minimum dry film thickness recommended by the manufacturer to provide a high quality, durable finish and optimum corrosion protection.

G. Follow the paint manufacturer's instructions for curing paint. Paint shall be properly cured before graphics are applied.

PART 3 EXECUTION

3.01 INSTALLATION

A. Prepare the locations where wayfinding signs are to be installed.

1. Mask off and protect areas which may be stained, damaged, or adversely affected by installation of the wayfinding signs.

2. Properly clean and prepare surfaces indicated to receive wayfinding signs prior to installation so that the installation may proceed smoothly and the wayfinding signs may be installed properly.

3. Contact all appropriate services to locate buried utilities prior to digging.

4. Provide all required warning signs and safety barricades at work areas to prevent accidents, accidental injuries, or property damage.

B. All wayfinding sign installation Work shall be scheduled to coordinate with the overall Project schedule. Prior to the start of any installation Work, provide the Library and the Architect with a complete installation schedule that has been coordinated with the overall Project Schedule for review.

C. Complete installation shall be in accordance with manufacturers' printed instructions and accepted Shop Drawings.

D. Maintain the warranties of the surfaces and finishes where signs are mounted.

E. Carefully, securely, properly, and safely install all wayfinding signs plumb and level in the correct locations.

F. Protect all installed wayfinding signs from damage until acceptance by the Architect and

Library.

G. Do not install any items that are improperly sized, damaged, scratched, or with any other defects.

3.02 SITE RESTORATION

A. Repair and restore to original condition and appearance any finishes, surfaces, pavements, landscaping, and any other site and building conditions, finishes, and features that are affected by the installation of the wayfinding signs.

3.03 COMPLETION

A. The Work shall not be considered as completed and accepted until written notice is received from the Library confirming the completion and acceptance of all Work, including all Punch List Work.

B. Upon completion and before final acceptance of the Work, provide a complete set of drawings and digital files documenting As-Built conditions for all wayfinding signs, wayfinding sign locations, and wayfinding sign messages. Drawings and digital files shall be formatted as specified by the Library. As-Built Drawings shall completely document all the Work as actually located, built, and installed. As-Built Drawings shall also include complete documentation of any and all changes made to the Work as shown in the Contract Documents and the Shop Drawings. As-Built drawings shall include complete documentation of all the final sign messages.

C. Upon completion and before final acceptance of the Work, provide the Library with a complete set of digital files for all Submittals.

D. Before final acceptance of the Work, provide all specified Attic Stock and all specified documentation including, but not limited to, Product Data, maintenance and safety inspection instructions, and all warranty documentation.

E. All digital files, silkscreens, patterns, and models shall be preserved and shall become the property of the Library.

END OF SECTION

Message Schedule

Sign Location / Sign Number	Arch Rm #	Overall Sign Message: Room #	Overall Sign Message: Arr.	Overall Sign Message: Symb.	Message	Sign Type	Sign Mounting	Graphic Elevation	Remarks
					(bookshelf Insert header)	C-1	Bookshelf		Final quantity needed.
01					(directory cabinet)	W-2	Wall		
02					(directory cabinet)	W-2	Wall		
03			←↓		Courtyard Children's Library	DIR-1	Wall		
04			←↑		Courtyard Children's Library	DIR-1	Wall		
05					Library Hours M-F 9-5 S 10-5 S 12-3	L-3	Glass		Vinyl letters on glass door window.
10					FRIENDS READING ROOM	L-1	Wall		
11					ADULT SERVICES	L-1	Wall		
12						DIR-2	Wall		
13						DIR-2	Wall		
14					CHECK OUT	T-1	Desk		

Lake Forest Library
Signage and Wayfinding
Lake Forest, Illinois

Studio Kul, Inc.
805 Lake Street, PMB 1021
Oak Park, IL 60301
773.312.5654

Job Number: 2101.1
Date: 10.20.26
Revisions:

1

ISSUED FOR BID

Message Schedule

Sign Location / Door Number	Arch Rm #	Overall Sign Message: Room #	Arr.	Symb.	Message	Sign Type	Sign Mounting	Graphic Elevation	Remarks
20					MEDIA LAB	L-2	Wall		Temporary sign.
21					BUSINESS COLLECTION	L-2	Wall		Temporary sign.
22					ADULT SERVICES	T-1	Desk		Message appears on both sides of desk sign.
30				⊖	No Entry Library Staff Only	W-1.4	Wall		
31					FINE ARTS COLLECTION	L-2	Wall		Temporary sign.
32					FINE ARTS COLLECTION	L-2	Wall		Temporary sign.

Lake Forest Library
Signage and Wayfinding
Lake Forest, Illinois

Studio Kui, Inc.
805 Lake Street, PMB 1021
Oak Park, IL 60301
773.312.5854

Job Number: 2101.1
Date: 10.20.26
Revisions:

2

ISSUED FOR BID

PART 1 GENERAL

1.1 SECTION INCLUDES
- A. Indoor gas log sets and all operational accessories.
- B. Inspect firebox, damper, flue and chimney cap for operational integrity; For fireplaces in Friends' Reading Room and Adult Services Room document all proposed repairs.
- C. Perform all required repairs and clean firebox and flues for fireplaces.
- D. Verify integrity of Friends' Reading Room gas line.
- E. Provide new gas line to Adult Services firebox.

1.2 REFERENCE STANDARDS
- A. ANSI Z21.50 - Vented Decorative Gas Appliances; 2019 (Reaffirmed 2024).
- B. NFPA 54 - National Fuel Gas Code; 2024.
- C. NFPA 211 - Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances; 2024.

1.3 SUBMITTALS
- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. Product Data: Provide gas log product-data, applicable regulatory agency approvals, and electrical connection information.
- C. Shop Drawings: Indicate layout, elevations, and sections with regard to existing firebox and chimney flue dimensions.
- D. Manufacturer's Certificate: Certify fireplace components meet or exceed UL (DIR) requirements.
- E. Manufacturer's Instructions: Indicate installation procedures and component installation sequence, clearances and tolerances from adjacent construction.
- F. Executed warranty.

1.4 QUALITY ASSURANCE
- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, 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.

PART 2 PRODUCTS

2.1 GAS LOG SETS
- A. Manufacturers:
  1. R.H. Peterson, Co.; "Real Frye" Gas Log - Model # G45-36-02-SDP 36: www.realfyre.com.
  2. Substitutions: See Section 01 60 00 - Product Requirements.
- B. Description:
  1. Vented Gas Log Set: Used in existing wood-burning fireplace with fully operational chimney and serve as replacement for real wood logs. Chimney damper remains open at all times.
  2. Location: Indoor
  3. Log Set Profile: One-sided
  4. Log Set Style: Coal grate
  5. Log Set Appearance: Oak
  6. Log Set Material: Refractory ceramic
  7. Log Set Size: 12 inches
  8. Gas Type: Natural

9. Ignition Type: Electronic, with battery-powered ignition (2 size "D" batteries)
10. Remote: ON/OFF remote and LCD thermostatic remote
11. Burner Type: Stainless steel

C. Design Criteria:
1. Comply with ANSI Z21.60/CSA 2.26 for vented gas log sets for installation in solid-fuel burning fireplaces.

2.2 ACCESSORIES

A. Firebox Grate: Wrought steel
B. Spark Arrestor Screen: For Adult Services Room fireplace only, match existing in Friends' Reading Room; steel mesh, set in steel frame, and black painted
C. Fasteners and Anchors: Stainless steel

PART 3 EXECUTION

3.1 VERIFICATION OF CONDITIONS

A. Verify prepared openings are ready to receive work and opening dimensions are as indicated on drawings.
B. Verify that a proper natural gas line fuel source is available.

3.2 INSTALLATION

A. Comply with applicable code for clearances from adjacent materials and unit UL approval.
B. Comply with applicable codes, NFPA 54, and ANSI Z223.1 for installation of natural gas burning appliances and equipment.
C. Install unit assembly in accordance with manufacturer's instructions and UL requirements.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Above ground piping.
B. Escutcheons.
C. Mechanical couplings.
D. Pipe hangers and supports.
E. Pipe sleeves.
F. Pipe sleeve-seal systems.
G. Piping specialties.

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.
B. Section 099113 - Exterior Painting: Preparation and painting of exterior fire protection piping systems.
C. Section 099123 - Interior Painting: Preparation and painting of interior fire protection piping systems.
D. Section 210523 - General-Duty Valves for Water-Based Fire-Suppression Piping.
E. Section 210553 - Identification for Fire Suppression Piping and Equipment: Piping identification.
F. Section 211300 - Fire-Suppression Sprinkler Systems: Sprinkler systems design.

1.03 REFERENCE STANDARDS

A. ASME B40.100 - Pressure Gauges and Gauge Attachments; 2022.
B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2020.
C. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.
D. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard; 2020.
E. ASME B16.9 - Factory-Made Wrought Buttwelding Fittings; 2024.
F. ASME B16.11 - Forged Fittings, Socket-Welding and Threaded; 2021.
G. ASME B16.25 - Buttwelding Ends; 2022.
H. ASME B36.10M - Welded and Seamless Wrought Steel Pipe; 2022.
I. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).
J. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.
K. ASTM A135/A135M - Standard Specification for Electric-Resistance-Welded Steel Pipe; 2021.
L. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2023a.
M. ASTM A536 - Standard Specification for Ductile Iron Castings; 1984, with Editorial Revision (2019).
N. ASTM A795/A795M - Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use; 2021.
O. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2022a.

P. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

Q. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2023a.

R. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2020, with Errata (2023).

S. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2018.

T. AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings; 2021.

U. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2023.

V. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast; 2017, with Errata (2018).

W. AWWA C606 - Grooved and Shouldered Joints; 2022.

X. FM (AG) - FM Approval Guide; Current Edition.

Y. ITS (DIR) - Directory of Listed Products; Current Edition.

Z. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

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

BB. UL 393 - Indicating Pressure Gauges for Fire-Protection Service; Current Edition, Including All Revisions.

CC. UL 404 - Gauges, Indicating Pressure, for Compressed Gas Service; Current Edition, Including All Revisions.

DD. UL 405 - Standard for Safety Fire Department Connection Devices; Current Edition, Including All Revisions.

EE. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide manufacturer's catalog information. Indicate valve data and ratings.

C. Shop Drawings: Indicate pipe materials used, jointing methods, supports, and floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.

D. Manufacturer's qualification statement.

E. Installer's qualification statement.

F. Project Record Documents: Record actual locations of components and tag numbering.

G. Operation and Maintenance Data: Include installation instructions and spare parts lists.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Valve Stem Packings: Two for each type and size of valve.

1.05 QUALITY ASSURANCE

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

B. Installer Qualifications: Company specializing in performing work of the type specified in this section.
   1. Minimum three years experience.
   2. Approved by manufacturer.

C. Comply with FM (AG), UL (DIR), and ITS (DIR) or Warnock Hersey requirements.

D. Products Requiring Electrical Connection: Listed and classified as suitable for the purpose specified and indicated.

E. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

1.06 DELIVERY, STORAGE, AND HANDLING

A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Deliver and store valves in shipping containers, with labeling in place.

C. Provide temporary protective coating on cast iron and steel valves.

D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

1.07 WARRANTY

A. See Section 017800 - Closeout Submittals for additional warranty requirements.

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

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Sprinkler-based System:
   1. Comply with NFPA 13.

B. Welding Materials and Procedures: Comply with ASME BPVC-IX.

C. Provide system pipes, fittings, sleeves, escutcheons, seals, and other related accessories.

2.02 ABOVE GROUND PIPING

A. Steel Pipe: ASTM A795 Schedule 40, black.
   1. Steel Fittings: ASME B16.5 steel flanges and fittings.
   2. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings and ASME B16.4, threaded fittings.
   3. Malleable Iron Fittings: ASME B16.3, threaded fittings and ASTM A47/A47M.
   4. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.
   5. Mechanical Formed Fittings: Carbon steel housing with integral pipe stop and O-ring pocked and O-ring, uniformly compressed into permanent mechanical engagement onto pipe.

B. Ductile Iron Pipe: AWWA C151/A21.51.
   1. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped composition sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.

2.03 PIPE SLEEVES

A. Vertical Piping:
   1. Sleeve Length: 1 inch (25 mm) above finished floor.
   2. Provide sealant for watertight joint.
   3. Blocked Out Floor Openings: Provide 1-1/2 inch (40 mm) angle set in silicon adhesive around opening.
   4. Drilled Penetrations: Provide 1-1/2 inch (40 mm) angle ring or square set in silicone adhesive around penetration.

B. Pipe Passing Through Floors:
   1. Galvanized steel pipe or black iron pipe with asphalt coating.
   2. Connect sleeve with floor plate except in mechanical rooms.

C. Clearances:
   1. Wall, Floor, Floor, Partitions, and Beam Flanges: 1 inch (25 mm) greater than external; pipe diameter.
   2. Rated Openings: Caulked tight with firestopping material complying with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.

2.04 PIPE SLEEVE-SEAL SYSTEMS

A. Modular Mechanical Seals:
   1. Elastomer-based interlocking links to continuously fill annular space between pipe and wall-sleeve, wall or casing opening.
   2. Watertight seal between pipe and wall-sleeve, wall or casing opening.
   3. Size and select seal component materials in accordance with service requirements.
   4. Service Requirements:
      a. Corrosion resistant.
      b. Oil, fuel, gas, and solvent resistant.
      c. Underground, buried, and wet conditions.

B. Wall Sleeve: Steel material with waterstop collar, and nailer end caps.

2.05 PIPE HANGERS AND SUPPORTS

A. Hangers for Pipe Sizes 1/2 to 1-1/2 inch (15 to 40 mm): Malleable iron, adjustable swivel, split ring.

B. Hangers for Pipe Sizes 2 inches (50 mm) and Over: Carbon steel, adjustable, clevis.

C. Vertical Support: Steel riser clamp.

D. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

2.06 MECHANICAL COUPLINGS

A. Rigid Mechanical Couplings for Grooved Joints:
   1. Dimensions and Testing: Comply with AWWA C606.
   2. Minimum Working Pressure: 300 psig (2065 kPa).
   3. Housing Material: Fabricate of ductile iron complying with ASTM A536.
   4. Housing Coating: Factory applied orange enamel.
   5. Gasket Material: EPDM suitable for operating temperature range from minus 30 degrees F (minus 34 degrees C) to 230 degrees F (110 degrees C).
   6. Bolts and Nuts: Hot-dipped-galvanized or zinc-electroplated steel.

2.07 PIPING SPECIALTIES

A. Dry Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber-faced clapper to automatically actuate water motor alarm, accelerator, and with the following additional capabilities and features:
   1. Activate electric alarm.
   2. Test and drain valve.
   3. Externally resettable.
   4. Replaceable internal components without removing valve from installed position.

B. Auxiliary Drains: Condensate collection drain for each section of trapped pipe in preaction or dry fire protection system.
   1. Manufacturers:
      a. AGF Manufacturing: www.agfmfg.com.

C. Test Connections:
   1. Combination Inspector's Test Connection and Drain Valve:
      a. Provide test connections approximately 6 feet (2 m) above floor for each or portion of each sprinkler system equipped with an alarm device, located at most remote part of each system.

b. Route combination test connection and drain valve to an open-site drain location, excluding janitor sinks, accepting full flow without negative consequences.
c. Supply discharge orifice with same size as corresponding sprinkler orifice.
d. Limit vertical height of exterior wall penetration to 2 feet (0.61 m) above finished grade.

D. Water Flow Switch: Vane-type switch for mounting horizontally or vertically, with two contacts; rated 10 A at 125 VAC and 2.5 A at 24 VDC.

E. Supervisory Switches:
1. Manufacturers:
a. Potter Electric Signal Company, LLC: www.pottersignal.com.

2.08 PRESSURE GAUGES

A. Pressure Gauges: ASME B40.100, UL 393 drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.
1. Case: Steel with brass bourdon tube.
2. Diameter: 4-1/2 inch (115 mm).
3. Mid-Scale Accuracy: One percent.
4. Scale: Display in psi and kPa.

PART 3 EXECUTION

3.01 PREPARATION

3.02 INSTALLATION

A. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.

B. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

C. Install piping to conserve building space, to not interfere with use of space and other work.

D. Group piping whenever practical at common elevations.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Inserts:
1. Provide inserts for placement in concrete formwork.
2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches (100 m).
4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

G. Pipe Hangers and Supports:
1. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.
2. Place hangers within 12 inches (300 mm) of each horizontal elbow.
3. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
4. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.

H. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.

I. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welding.
   1. Painting of interior fire suppression systems is specified in Section 099123.
   2. Painting of exterior fire suppression systems is specified in Section 099113.

J. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
   1. Aboveground Piping:
      a. Pack solid using mineral fiber complying with ASTM C592.
      b. Fill space with an elastomer caulk to a depth of 0.50 inch (15 mm) where penetrations occur between conditioned and unconditioned spaces.
   2. All Rated Openings: Caulk tight with firestopping material complying with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.
   3. Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.

K. Manufactured Sleeve-Seal Systems:
   1. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
   2. Locate piping in center of sleeve or penetration.
   3. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
   4. Install in accordance with manufacturer's recommendations.

L. Escutcheons:
   1. Install and firmly attach escutcheons at piping penetrations into finished spaces.
   2. Provide escutcheons on both sides of partitions separating finished areas through which piping passes.
   3. Use chrome plated escutcheons in occupied spaces and to conceal openings in construction.

M. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, unions, and couplings for servicing are consistently provided.

N. Die-cut threaded joints with full-cut, standard taper pipe threads with red lead and linseed oil or other non-toxic joint compound applied to male threads only.

3.03 CLEANING

A. Upon completion of work, clean all parts of the installation.

B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wet-pipe sprinkler system.

B. System design, installation, and certification.

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

B. Section 078700 - Smoke Containment Barriers: Smoke and fire curtains to be released by activation of sprinkler system.

C. Section 210500 - Common Work Results for Fire Suppression: Pipe and fittings.

D. Section 210523 - General-Duty Valves for Water-Based Fire-Suppression Piping.

E. Section 210553 - Identification for Fire Suppression Piping and Equipment.

F. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

G. Section 284600 - Fire Detection and Alarm.

1.03 REFERENCE STANDARDS

A. FM (AG) - FM Approval Guide; Current Edition.

B. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2018, with Editorial Revision (2020).

C. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry; 2018, with Editorial Revision (2020).

D. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2017, with Editorial Revision (2020).

E. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2023.

F. ITS (DIR) - Directory of Listed Products; Current Edition.

G. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. NFPA 1963 - Standard for Fire Hose Connections; 2019.

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

J. UL 405 - Standard for Safety Fire Department Connection Devices; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene one week before starting work of this section.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

C. Shop Drawings:
   1. Submit preliminary layout of finished ceiling areas indicating only sprinkler locations coordinated with ceiling installation.
   2. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components, and accessories. Indicate system controls.
   3. Submit shop drawings to Authorities Having Jurisdiction for approval. Submit proof of approval to Architect.

D. Manufacturer's Certificate: Certify that system has been tested and meets or exceeds specified requirements and code requirements.

E. Operation and Maintenance Data: Include components of system, servicing requirements, record drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements for additional provisions.
   2. Extra Sprinklers: Type and size matching those installed in quantity required by referenced NFPA design and installation standard.
   3. Sprinkler Wrenches: For each sprinkler type.

G. Project Record Documents: Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.

1.06 QUALITY ASSURANCE

A. Comply with FM (AG) requirements.

B. Designer Qualifications: Design system under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

C. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Sprinklers, Valves, and Equipment:
   1. Anvil International: www.anvilintl.com/#sle.
   2. Tyco Fire Protection Products: www.tyco-fire.com/#sle.
   3. Viking Corporation: www.vikinggroupinc.com/#sle.
   4. Victaulic Fire Protection

2.02 SPRINKLER SYSTEM

A. Sprinkler System: Provide coverage for entire building.

B. Occupancy: Light hazard; comply with NFPA 13.

C. Water Supply: Determine volume and pressure from water flow test data.
   1. Revise design when test data available prior to submittals.

D. Interface system with building control system.

E. Provide fire department connections where indicated.

F. Storage Cabinet for Spare Sprinklers and Tools: Steel, located adjacent to alarm valve.

G. Pipe Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
   1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
   2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
   3. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
   4. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.
   5. Other Types: As required.
   6. Manufacturers:
      a. AFCON, a brand of Anvil International: www.anvilintl.com/#sle.
      b. Powers Fasteners, Inc www.powers.com/#sle.

2.03 SPRINKLERS

A. Ceiling Exposed Pendent Type: Chrome-plated finish with matching escutcheon.
   1. Response Type: Quick.
   2. Coverage Type: Standard.

3. Finish: Chrome plated or match existing. Coordinate with Architect.
4. Escutcheon Plate Finish: Two-piece or one-piece escutcheon compatible with sprinkler; finish to match sprinkler.
5. Fusible Link: Glass bulb type temperature rated for specific area hazard.
6. Manufacturers:
   a. Tyco Fire Protection Products: www.tyco-fire.com/#sle.
   b. Substitutions: See Section 016000 - Product Requirements.

B. Exposed Area Type: Upright type.
1. Response Type: Quick.
2. Coverage Type: Standard.
3. Finish: Brass.
4. Fusible Link: Glass bulb type temperature rated for specific area hazard.
5. Manufacturers:

C. Sidewall Type: Semi-recessed horizontal sidewall type with matching push on escutcheon plate.
1. Response Type: Quick.
2. Coverage Type: Standard.
3. Finish: Brass.
4. Escutcheon Plate Finish: Brass.
5. Fusible Link: Glass bulb type temperature rated for specific area hazard.

D. Guards: Finish to match sprinkler finish.

2.04 PIPING SPECIALTIES

A. Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber-faced clapper to automatically actuate water motor alarm, pressure retard chamber and variable pressure trim with the following additional capabilities and features:
1. Activate electric alarm.
2. Test and drain valve.
3. Replaceable internal components without removing valve from installed position.

B. Test Connections:
1. Backflow Preventer Test Connection:
   a. Provide downstream of the backflow prevention assembly, listed hose valves with 2.5 inch (65 mm) National Standard male hose threads with cap and chain.
   b. Furnish one valve for each 250 gpm (16 L/s) of system demand or fraction thereof.
   c. Provide permanent sign reading "Test Valve" in accordance with Section 210553.
   d. Manufacturers:
      1) Substitutions: See Section 016000 - Product Requirements.

C. Water Motor Alarm: Hydraulically operated impeller type alarm with aluminum alloy chrome plated gong and motor housing, nylon bearings, and inlet strainer.

D. Electric Alarm: Electrically operated chrome plated gong with pressure alarm switch.

E. Water Flow Switch: Vane type switch for mounting horizontal or vertical, with two contacts; rated 10 amp at 125 volt AC and 2.5 amp at 24 volt DC.

F. Fire Department Connections:
1. Type: Exposed, projected wall mount made of corrosion resistant metal complying with UL 405.
   a. Inlets: Two way, 2-1/2 inch (65 DN) swivel fittings, internal threaded. Thread size and inlets according to NFPA 1963 or Authority Having Jurisdiction. Brass caps with gaskets, chains, and lugs.
   b. Configuration: Horizontal.
   c. Rated Working Pressure: 175 psi (1200 kPa).
   d. Finish: Brass or bronze.

e. Signage: Raised or engraved lettering 1 inch (25.4 mm) minimum indicating system type.

G. Supervisory Switches:
1. Manufacturers:
a. Potter Electric Signal Company, LLC; CoilKeeper Solenoid Supervisory Switch: www.pottersignal.com/#sle.
b. Substitutions: See Section 016000 - Product Requirements.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with referenced NFPA design and installation standard.

B. Install equipment in accordance with manufacturer's instructions.

C. Provide approved double check valve assembly at sprinkler system water source connection.

D. Place pipe runs to minimize obstruction to other work.

E. Place piping in concealed spaces above finished ceilings.

F. Center sprinklers in two directions in ceiling tile and provide piping offsets as required.

G. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.

H. Flush entire piping system of foreign matter.

I. Install guards on sprinklers where indicated.

J. Hydrostatically test entire system.

K. Require test be witnessed by Fire Marshal.

3.02 INTERFACE WITH OTHER PRODUCTS

A. Ensure required devices are installed and connected as required to fire alarm system.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Drains.
B. Cleanouts.
C. Backflow preventers.
D. Double check valve assemblies.
E. Water hammer arrestors.
F. Mixing valves.
G. Floor drain trap seals.

1.02 RELATED REQUIREMENTS

A. Section 016000 - Product Requirements: Procedures for Owner-supplied products.
B. Section 221005 - Plumbing Piping.
C. Section 223000 - Plumbing Equipment.
D. Section 224000 - Plumbing Fixtures.
E. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
B. ASME A112.6.3 - Floor Drains; 2022.
C. ASSE 1012 - Performance Requirements for Backflow Preventers with an Intermediate Atmospheric Vent; 2021.
D. ASSE 1013 - Performance Requirements for Reduced Pressure Principle Backflow Prevention Assemblies; 2021.
E. ASSE 1015 - Performance Requirements for Double Check Backflow Prevention Assemblies; 2021.
F. ASSE 1016 - Performance Requirements for Automatic Compensating Valves for Individual Showers and Tub/Shower Combinations; 2017 (Reaffirmed 2021).
G. ASSE 1017 - Performance Requirements for Temperature Actuated Mixing Valves for Hot Water Distribution Systems; 2023.
H. ASSE 1047 - Performance Requirements for Reduced Pressure Detector Backflow Prevention Assemblies; 2021.
I. ASSE 1048 - Performance Requirements for Double Check Detector Backflow Prevention Assemblies; 2021e.
J. ASSE 1069 - Performance Requirements for Automatic Temperature Control Mixing Valves; 2020.
K. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices; 2020.
L. ASTM B75/B75M - Standard Specification for Seamless Copper Tube; 2020.
M. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.
N. ASTM B306 - Standard Specification for Copper Drainage Tube (DWV); 2020.
O. ASTM F1267 - Standard Specification for Metal, Expanded, Steel; 2018 (Reapproved 2023).
P. NSF 2 - Food Equipment; 2022.
Q. NSF 61 - Drinking Water System Components - Health Effects; 2023, with Errata.
R. NSF 372 - Drinking Water System Components - Lead Content; 2024.

S. PDI-WH 201 - Water Hammer Arresters; 2017.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.

C. Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.

D. Manufacturer's Instructions: Indicate Manufacturer's Installation Instructions: Indicate assembly and support requirements.

E. Sustainable Design Documentation: Submit appropriate evidence that materials used in potable water systems comply with the specified requirements.

F. Manufacturer's qualification statement.

G. Operation Data: Indicate frequency of treatment required for interceptors.

H. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

I. Project Record Documents: Record actual locations of equipment, cleanouts, backflow preventers, and water hammer arrestors.

J. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements for additional provisions.

1.05 QUALITY ASSURANCE

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

1.06 DELIVERY, STORAGE, AND HANDLING

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

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

2.02 DRAINS

A. Floor Drain <>:
   1. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer.

2.03 CLEANOUTS

A. Cleanouts at Interior Finished Floor Areas <>:
   1. Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.

B. Cleanouts at Interior Finished Wall Areas <>:

C. Cleanouts at Interior Unfinished Accessible Areas <>: Calked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

2.04 BACKFLOW PREVENTERS

A. Reduced Pressure Backflow Preventer Assembly:
   1. ASSE 1013 and NSF 61 compliant reinforced-nylon body and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve that opens under back pressure in case of diaphragm failure, integral male test fittings, and non-threaded vent outlet.

2. Size: 3/4 to 2 inch (20 to 50 mm, DN) assembly with threaded full port ball valves.
3. Maximum Working Parameters: 175 psi (1,207 kPa) at 180 degrees F (82.2 degrees C).
4. Accessories: Provide air gap fitting, lead-free Y-strainer, and test cocks.

2.05 DOUBLE CHECK-VALVE ASSEMBLIES

A. Double Check Detector Assemblies:
1. ASSE 1048 and NSF 61 compliant stainless steel body assembly with metered by-pass, corrosion resistant internal parts, stainless steel springs, intermediate atmospheric vent, two independently-operating check valves, and test-cock plug for horizontal or vertical mount.
2. Configured to protect against backsiphonage and backpressure into potable water supply.
3. Size: 2-1/2 to 10 inch (65 to 250 mm, DN) assembly with flanged OS&Y gate valves.
4. Maximum Working Parameters: 175 psi (1,207 kPa) at 140 degrees F (60 degrees C).
5. Accessories: Provide flanged Y-strainer, remote reader for meter, and test cock.

2.06 WATER HAMMER ARRESTORS

A. Water Hammer Arrestors:
1. Stainless steel construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range minus 100 to 300 degrees F (minus 73 to 149 degrees C) and maximum 250 psi (1700 kPa) working pressure.

2.07 MIXING VALVES

A. Thermostatic Master Mixing Valves:
1. Valve: ASSE 1017, bronze or brass body; thermostatic element; corrosion- and lime-resistant internal components; integral locking temperature adjustment.
2. Finish: Rough bronze.
3. Accessories:
a. Strainer stop checks on inlets.
b. Shut-off valve on outlet.

B. Automatic Temperature Control Mixing Valves:
1. Valve: ASSE 1069, bronze or brass body; thermostatic element; corrosion- and lime-resistant internal components; integral locking temperature adjustment; integral check valves with strainer screens on inlets.
2. Finish: Rough bronze.
3. Accessories:
a. Shut-off valve on outlet.

C. Water Temperature Limiting Valves:
1. Valve: ASSE 1070, bronze or brass body; thermostatic element; corrosion- and lime-resistant internal components; integral locking temperature adjustment with high-temperature limit stop; integral check valves with strainer screens on inlets.

2.08 FLOOR DRAIN TRAP SEALS

A. Description: Push-fit EPDM or silicone fitting with a one-way membrane.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.

C. Encase exterior cleanouts in concrete flush with grade.

D. Install floor cleanouts at elevation to accommodate finished floor.

E. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.

F. Pipe relief from backflow preventer to nearest drain.

G. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatory sinks or washing machine outlets.

H. Install air chambers on hot and cold water supply piping to each fixture or group of fixtures (each washroom). Fabricate same size as supply pipe or 3/4 inch (20 mm) minimum, and minimum 18 inches (450 mm) long.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. All basic design criteria used for the sizing and selection of mechanical systems.

1.02 RELATED DOCUMENTS

A. The Drawings, General Provisions of the Contract, including the General Conditions, General Requirements, Supplemental General Conditions and Division 23 all apply to the work in this Section.

B. Section 230010 - Mechanical General Requirements

C. Section 232113 - Hydronic Piping

D. Section 232114 - Hydronic Specialties

E. Section 233100 - HVAC Ducts and Casings

F. Section 233300 - Air Duct Accessories

1.03 CODES AND STANDARDS

A. Codes:
1. City of Lake Forest, IL - Building Code
2. City, County and/or State Fire Codes
3. National Electrical Code (NEC)
4. City, County and/or State Electrical Codes
5. Occupational Safety and Health Administration (OSHA)
6. Applicable Local Codes and Ordinances

B. Standards:
1. Air Conditioning and Refrigeration Institute (ARI)
2. Air Diffusion Council (ADC)
3. Air Movement and Control Association, Inc. (AMCA)
4. American Gas Association (AGA)
5. American National Standards Institute (ANSI)
6. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) Handbooks: Latest Editions
7. American Society of Mechanical Engineers (ASME)
8. American Society for Testing and Materials (ASTM)
9. American Water Works Association (AWWA)
10. Institute of Boiler and Radiator Manufacturers (IBR)
11. Manufacturers Standardization Society of the Valve and Fitting Industry (MSS)
12. National Electrical Manufacturers Association (NEMA)
13. National Fire Protection Association (NFPA)
14. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA)
15. Underwriters Laboratories (UL)

1.04 DESIGN CRITERIA

A. Outside Temperature:
1. Heating: -7 degrees F.
2. Heating: Minimum Mean Extreme Annual Temperature, Chicago, IL Midway Airport.
3. Cooling (sensible): 92 degrees F. DB, 74 degrees F. WB
4. Cooling (ventilation / latent): 88 degrees F. DB, 78 degrees F. WB
5. Cooling: 0.4% of ASHRAE Design Conditions, Chicago, IL Midway Airport
6. Condensing unit: 95 degrees F. DB

B. Inside Temperature:
1. Occupied Areas
    a. Heating: 70 degrees F. + or - 1 degrees F

b. Cooling: 74 degrees F. + or - 1 degrees F

2. A/V Rooms:
   a. Heating: 65 degrees F. + or - 1.5 degrees F
   b. Cooling: 78 degrees F. + or - 1.5 degrees F; 55% RH + 5% RH

1.05 DUCTWORK SIZING

A. Unless noted otherwise, size ductwork as per the following criteria.

B. Duct Friction Loss Sizing Criteria (Trane Company Ductulator):
   1. Low Pressure:
      a. 0.08 inch W.G. maximum/100 equivalent feet of duct run.

C. Duct Velocity Criteria:
   1. Low Pressure:
      a. 1,200 FPM or 0.1"/100ft maximum for supply duct.
      b. 1,000 FPM maximum for exhaust or return duct.
      c. 1,000 FPM maximum for intake or return air shaft.
      d. 400 FPM maximum for relief or transfer air.
      e. Air velocities have been adjusted lower as required for acoustical coordination purposes throughout design.

1.06 AIR CONDITIONING ACOUSTICAL PERFORMANCE

A. General: It is the intent of this specification that noise levels due to air conditioning equipment, etc., will permit attaining sound pressure levels in occupied spaces conforming to the following N/RC curves as explained in the latest issue of the ASHRAE Applications Handbook:
   1. All occupied spaces shall be N/RC 30:
   2. Acoustical Performance within Equipment Spaces: Equipment room noise levels and noise transmission to adjacent spaces shall comply with all City, County and/or State Codes and Ordinances.
   3. Refer to Threshold Acoustics specifications for additional information.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. All basic requirements for the mechanical systems installations.

1.02 RELATED DOCUMENTS

A. The Drawings, General Provisions of the Contract, including the General Conditions, General Requirements and Supplemental General Conditions all apply to the work in this Section.

B. Section 230005 - Mechanical Design Criteria

C. Section 230040 - Demolition

D. Section 230513 - Common Motor Requirements for HVAC

E. Section 230519 - Meters and Gages for HVAC Piping

F. Section 230548 - Vibration Isolation for HVAC Piping and Equipment

G. Section 230553 - Identification for HVAC Piping and Equipment

H. Section 230593 - Testing, Adjusting and Balancing for HVAC

I. Section 230713 - Duct Insulation

J. Section 230716 - HVAC Equipment Insulation

K. Section 230719 - HVAC Piping Insulation

L. Section 230913 - Instruments and Control Devices

M. Section 230993 - Sequence of Operations for HVAC Controls

N. Section 232113 - Hydronic Piping

O. Section 232114 - Hydronic Specialties

P. Section 232300 - Refrigerant Piping

Q. Section 232330 - Natural Gas Piping and Specialties

R. Section 233100 - HVAC Ducts and Casings

S. Section 233300 - Air Duct Accessories

1.03 DESCRIPTION OF WORK

A. The Work under this Section includes, but is not limited to, providing all labor, material, equipment and services necessary for completion of all mechanical systems in a serviceable fully operational manner.

B. All items of Work and systems shall be furnished and installed ready for satisfactory operation and all required apparatus and service shall be provided even though not specifically mentioned herein.

C. The Contract Specifications and Contract Drawing Equipment Schedules list the equipment manufacturers selected for the basis of the Specifications and for the various individual equipment layouts on the Contract Drawings.

D. Substitutions shall be made in accordance with General Conditions and as otherwise provided in the Contract Documents.

E. The Drawings showing the layout, arrangements, sizes and principal connections to the equipment and apparatus are based on one particular type of equipment of an acceptable manufacturer. If equipment, other than the particular type shown on the layout Drawings is used, it is the Contractor's sole responsibility to make all necessary modifications to related piping, ductwork, electrical and utility connections, apparatus and miscellaneous items to complete the Mechanical Work, ready for satisfactory operation required under these Specifications. The cost of making all the modifications shall be borne by this Contractor

without extra cost to the Owner including any additional engineering costs requested by the Engineer to review such substitutions.

F. In using such equipment, it is imperative that the equipment must fit the space and the access allotted, with the final layout to be approved by the Engineer. Follow the Drawings as closely as actual building construction permits.

G. The Drawings show the principal engineering design elements of the mechanical installation. They are not intended as detailed construction installation drawings for the Mechanical Work but as a complement to the Specifications to clarify the principal features of the mechanical systems.

H. It is the intent of this Section that all equipment and devices, furnished and installed under this and other Sections, be properly connected and interconnected with other equipment so as to render the installation complete for successful operation, regardless of whether all the connections and interconnections are specifically mentioned in the Contract Specifications or shown on the Contract Drawings.

I. Specifications and Drawings are intended to be cooperative. What is called for a either shall be as binding as if called for by both. Any Work or materials not specifically mentioned though required to make the job complete shall be furnished by the Contractor at his expense.

J. Check the layout of the Work of this Division, as indicated on the Drawings. Determine exact locations by the dimensions of the equipment approved. Obtain written approval from the Engineer for any revised layout before equipment or material involved is installed. Consult the existing Architectural and Structural Drawings for all dimensions, locations of partitions, locations and sizes of structural supports, foundations, swings of door and other detail information required for a correct installation of this Work.

K. Examine all other Divisions of the Contract Documents for Work related to the Work of this Division. Cooperate to provide continuity of Work, to eliminate duplications and to provide Mechanical Work in support of such related Work. Furnish to other trades and on schedule all information required for the execution of Mechanical Work.

L. Any additional Work such as cutting, drilling, patching, excavating, moving and or relocating of the Work of another trade because of delay in Mechanical Work or lack of information is a part of this Division and shall be performed without increase in Contract Price.

M. Install and connect devices and equipment in accordance with the best engineering practice and the manufacturer instructions and recommendations. Provide all incidental ductwork, piping, valves, connections and all similar material recommended by the manufacturer or required for proper operation and maintenance, complete without additional costs.

N. Perform any necessary excavation and backfilling to complete the Work of this Division in accordance with excavation and backfill provisions for the applicable Division of this Specification.

O. Provide all necessary rigging, scaffolding, tools, tackle, labor and other materials or equipment which may be necessary for the completion of the Work.

P. Furnish and install motor on proper frame designed by the driven equipment manufacturer.

Q. All control wiring associated with the mechanical systems shall be provided under Division 23. All wiring shall comply with Division 26.

R. Other Equipment and Systems Included in this Section:
   1. Equipment supplied by contractor.
   2. Noise and vibration control.
   3. Maintenance materials, service and spare parts.

S. Related Work Specified in Other Divisions:
   1. Openings: Wall, floor, ceiling and roof openings that are required for Mechanical Work or changes to such openings are part of the Work of this Mechanical Division.

2. Painting: Under this Division, all manufactured equipment shall be furnished with factory finished baked enamel, unless otherwise specified.

1.04 VISITING THE SITE

A. The contractor shall, prior to submitting his bid for doing work as described in this specification and on accompanying drawings, visit the site and completely familiarize himself with the difficulties and facilities that will be involved for the proper execution of the contract. No extra compensation shall be allowed for the contractor failing to do so or not to fully appreciate difficulties at hand.

1.05 QUALITY ASSURANCE

A. All materials furnished shall be new and shall comply with all applicable standards listed below.

B. All materials or work found to be defective or not in strict conformity with the Contract Documents or defaced or injured through any cause, shall be rejected and shall be removed by Contractor and satisfactory material and Work substituted without delay.

C. Contractor shall protect his Work by keeping all piping, equipment, etc., capped or plugged, drained or otherwise protected from injury by freezing, water damage or stoppage from material, concrete, sand or dirt and shall repair any such injury without additional charge to the User. Injury shall be interpreted to include scratches, discoloring and denting.

D. Contractor will be held responsible for any damage caused by him to the Work of other trades.

E. Submit shop drawings and product data for all equipment as specified or scheduled. Update all drawings to "as-built" status and submit to Engineer.

1.06 REFERENCES

A. Refer to General Conditions and Standard Specifications as called for in each Section.

1.07 QUALIFICATIONS

A. Refer to General Conditions, Standard Specifications and each Section.

1.08 REGULATORY REQUIREMENTS

A. Applicable Publications: Reference made herein to Standards, Specifications or Codes, refer to the latest edition including all addenda, errata or other revisions thereto, existing on the date of execution of the Contract.

B. Local Codes and Ordinances: Install all Work in conformance with all applicable Codes and State Ordinances and Statutes. Nothing in the Specifications or Drawings shall be construed to permit deviation from the governing Codes. In case of conflict with Local Ordinances and Statutes, the more stringent shall apply.

C. Abbreviations: Under Mechanical Sections make use of the following abbreviations in adopting applicable Standards and Codes as a part of Division 23:

1. ADC - Air Diffusion Council - Test Code
2. AMCA - Air Moving and Conditioning Association
3. ANSI - American National Standards Institute
4. API - American Petroleum Institute
5. ARI - Air Conditioning and Refrigeration Institute
6. AGA - American Gas Association
7. ASHRAE - American Society of Heating, Refrigerating and Air Conditioning Engineers
8. ASME - American Society of Mechanical Engineers
9. ASTM - American Society for Testing and Materials
10. AWS - American Welding Society
11. AWWA - American Water Works Association
12. EPA - Environmental Protection Agency
13. FM - Factory Mutual System
14. IRI - Industrial Risk Insurer

15. MSS - Manufacturers Standardization Society
16. NEC - National Electric Code
17. NEMA - National Electrical Manufacturers Association
18. NFC - National Fire Code
19. NFPA - National Fire Protection Association
20. NPC - National Plumbing Code
21. OSHA - Occupational Safety and Health Standards
22. SMACNA - Sheet Metal and Air Conditioning Contractor's National Association, Inc.
23. UL - Underwriters Laboratories, Inc.
24. MICA - Midwest Insulation Contractors Association

D. Permits and Inspections:
   1. Obtain and pay for all permits, bonds, licenses, tap-in fees, etc. required by the Local, State or other authority having jurisdiction over the work.
   2. Arrange and pay for inspections required by the above when they become due as a part of the work of the Sections affected. Conceal no work until approved by these governing authorities. Present the Owner with properly signed certificates of final inspection before Owner acceptance of the Work.
   3. Obtain and pay for all meters, gauges, instruments and devices required by the governing authorities except as otherwise noted as part of the Work of the Sections affected.

E. Third Party Certification:
   1. All packaged equipment shall be independently Third Party labeled as a system for it's intended use by a Nationally Recognized Testing Laboratory (NRTL) in accordance with OSHA Federal Regulations 29CFR1910.303 and 399, as well as NFPA Pamphlet #70 and National Electric Code (NEC), Article 90-7.

1.09 SUBSTITUTIONS

A. Product substitutions shall be in accordance with the General Conditions, Supplemental General Conditions and as herein specified.

B. The products, equipment, etc. scheduled on the Drawings or specified are the basis of design. Where more than one manufacturer is listed, the Contractor may use any of the acceptable manufacturers as the basis of their bids unless otherwise specified. However, the Contractor assumes all responsibility for changes to the design, installation, etc. as a result of the change, with respect to power characteristics, physical size, etc.

C. Any request for substitution to other than the specified acceptable manufacturers must be submitted to the Engineer in writing and shall include an adequate description of proposed change, reason for requesting change and cost adjustment information. Substitutions not submitted in this manner will be rejected automatically. Substitution requests will only be considered for the following reasons:
   1. Specified manufacturer is no longer in business.
   2. Specified product cannot be delivered within the required project schedule.
   3. Alternate product is of equal quality but better value with savings offered to the Owner.

1.10 SUBMITTALS

A. Submit as specified herein. The most stringent requirements shall apply.

B. General: Within 15 calendar days after Award of Contract, submit to the Engineer a typewritten list of all items of equipment and material proposed for installation on this project. Provide the specification page number, manufacturer name, model number, size non-standard accessories specified or required and any other information required to identify each item. Within 30 days after the Contractor has been given notice of approval of manufacturers, submit shop drawings of equipment and material proposed for this installation.

C. Shop Drawings: Submit shop drawings for all Work to be done under each of the Mechanical Sections and for all items and assemblies which are to be specifically fabricated for this Contract.

D. Coordination and Fabrication Drawings: Prepare layout drawings of all system assemblies of this Contract including plumbing, heating and cooling piping, mechanical room layout with equipment and piping, ductwork installations and control systems. Include completely dimensioned plans drawn to scale. Show elevations and sections indicating locations of all equipment, piping, ductwork, drains, controls and other items with reference to columns, walls, slabs, beams and to components of other systems and work of other trades. Floor plans shall be drawn at not less than ¼" scale. Tracing or reproduction of Construction Documents is not acceptable. Provide a minimum of one reproducible drawing and five prints of each drawing.

E. Catalog Cuts: Submit manufacturer data sheets and pictures of all standard manufactured items proposed for installation in this project. Clearly identify each item proposed, together with all required accessories and fittings, with tag numbers and specification page and line numbers. Include graphs, curves or charts, as applicable, with the specified operating point clearly marked.

F. Installation and bolt Setting Diagrams: Submit complete installation instructions and bolt setting information for items of equipment furnished under Division 23 such as pumps, fans, compressors, tanks, filters, pressure vessels, boilers, etc.

G. Wiring Diagrams: Provide specific wiring diagrams and instructions for all equipment, controls or devices which are furnished under Division 23 and are to be wired and connected by other trades. The diagrams and instructions shall not be of a general or typical nature, but shall be applicable to this Contract.

H. Samples: Where a Contractor proposes a manufacturer, material or method differing from that specified, the Engineer may require samples illustrative of the manufacturer, material or method. Submit such samples as part of the shop drawing requirements and shall include samples of insulation, special finishes, etc.

I. Submittals shall be made as required in the Contract Documents. In submitting shop drawings, illustrations and descriptive material for approval of the Engineer, the Contractor must clearly mark each shop drawing, catalog cut, pamphlet or specification sheet as follows, for purposes of identification and record:
   1. Date: (as submitted)
   2. Project Title:
   3. Location of Project:
   4. Branch of Work: (HVAC, Plumbing, Fire Protection, etc.)
   5. Specification Paragraph and Page:
   6. Submitted by: (Contractor Name)
   7. Contract No.:

1.11 PROJECT RECORD DOCUMENTS (AS-BUILT DRAWINGS)

A. Maintain Project Record Drawings during construction in accordance with General Conditions and as herein specified.

B. Provide Project Record Drawings at completion of project. Shop drawings are not acceptable as record drawings unless they have been revised to reflect all field changes. Tracing or reproduction of the Contract Documents shall not be acceptable.

C. Show the following information on the Project Record Drawings:
   1. All significant changes in plan, sections, elevations and details, such as all relocation or changes in ductwork and piping.
   2. All final locations of controls and final arrangement of electric circuits and any significant changes made in design as a result of change order or job conditions.
   3. Final location and arrangement of all mechanical equipment.

D. Provide a minimum of one reproducible copy and five prints of all Project Record Drawings.

1.12 DELIVERY, STORAGE AND HANDLING

A. Refer to the General Conditions, Standard Specifications and as specified in each individual section.

1.13 SCHEDULING

A. Refer to the General Conditions, Standard Specifications and as specified in each individual section.

1.14 WARRANTY

A. Except where otherwise specifically included in individual Sections, all mechanical systems shall be provided with the guarantees as follows.

B. Guarantee all mechanical systems, equipment, materials and workmanship to be free from defect for a period of 1 year from the date of final acceptance of the Work. Replace or repair in an approved manner any Work which may prove defective or not in compliance with the Contract Documents without additional cost to the Owner and without interference with building operation.

C. Deliver to the Engineer two (2) copies of all manufacturer or equipment supplier warranties made out in the name of the Owner before final acceptance of the work.

D. Make all adjustments required to ensure operation of the various systems in accordance with the intent of the Drawings and Specifications.

E. It is specifically understood that all adjustments to ensure the proper operation of the systems shall cover a period of 12 months following acceptance of the Work and the Contractors and/or their suppliers shall make all such adjustments required during this period without delay and without additional cost to the Owner.

1.15 PRESSURE TESTING

A. General: Each system of piping shall be tested by the Contractor.

B. After portions of the mechanical work are completed, the following tests shall be made in the presence of the Engineer and Owner representatives. Five (5) days advance written notice of the tests shall be given to the Engineer, who in turn will notify other parties interested. Furnish all gages, blowers, instruments, test equipment and personnel required for tests and make all provisions for removal of test equipment and draining of pipes after tests have been made.

C. Subject all piping and connection to a hydrostatic or pneumatic pressure test prior to painting, installation of insulation or concealment within the building. This test pressure shall be not less than 50% in excess of the pressure to which the pipe will ordinarily be subjected, unless otherwise hereinafter specified. No pipe shall be subjected to a test pressure of less than 100 PSI (345 kPa), except as otherwise specified.

D. Tests may be made of isolated portions of such piping as will facilitate general progress of the installation. Any revisions made in the piping system will subsequently necessitate retesting of such isolated portions of the piping systems.

E. Any defective material or defects in workmanship that develop during the tests shall be remedied and the subject piping re tested.

1.16 TESTING, ADJUSTING AND BALANCING

A. Contractor shall appoint and employ services of an independent firm to perform testing, adjusting and balancing.

B. The independent firm will perform services specified in Section 230593.

C. Reports will be submitted by the independent firm to the Engineer indicating observations and results of tests and indicating compliance or non-compliance with the requirements of the Contract Documents.

1.17 OPERATING TESTS

A. General: After various systems are pressure tested and cleaned as herein before specified, each piping and air handling system shall be tested in the presence of the Engineer's and Owner's representatives. Five days' advance written notice of the tests shall be given to the Engineer by the Contractor who in turn will notify other parties interested. Furnish all gages, instruments, test equipment and personnel required for the tests. Adjust all equipment to perform with the least possible noise and vibration consistent with its duty. Quietness of operation of all equipment is a requirement. Any equipment producing objectionable noise in occupied spaces must be repaired or removed and replaced with satisfactory equipment.

B. Tests shall be performed by the Contractor, utilizing procedures set forth by the Sheet Metal and Air Conditioning Contractor's National Association (SMACNA).

C. Piping Systems: Operate the heating and cooling systems and make all adjustments in controls and equipment, and complete necessary balancing to deliver not less than the steam or water quantities shown on the drawings at each equipment item.

1.18 OPERATING INSTRUCTIONS TO OWNER

A. Contractor shall furnish Engineer with a written statement from the Owner certifying acceptance of the equipment data and instruction of the operators. Engineer will not approve the request for final payment until this certificate has been submitted.

1.19 ACCEPTANCE

A. The start up and testing plan will be initiated as soon as the equipment is installed and the system has been completed and ready.

B. The equipment shall be tested by the Testing and Balancing Contractor for meeting the specified requirements as well as the original intent of the equipment design and operation.

C. All discrepancies shall be corrected in a timely manner by the vendor at no cost to the Owner.

D. As soon as all criteria has been met to the satisfaction of the Owner and Mechanical Engineer, a formal acceptance document will be sent to the vendor.

E. After formal acceptance has been completed, a payment schedule to the Contractor can be initiated.

PART 2 - PRODUCTS

2.01 EQUIPMENT SUPPLIED BY CONTRACTOR

A. Contractor furnishing an item of equipment, including pre-purchased equipment, is responsible for the proper handling, setting, installation, start-up and initial operation.

B. If Contractor is unfamiliar with the proper start-up and adjustment procedure of any equipment or system furnished by him, he shall include the services of a qualified representative of the manufacturer or vendor to provide start-up assistance and for instruction of Owner personnel.

C. Contractor shall include all necessary allowances to insure that all equipment and systems furnished will be serviced as required during the guarantee period.

D. When a manufacturer offers an extended warranty at additional cost, such extended warranty shall be included as alternate.

2.02 NOISE AND VIBRATION CONTROL

A. Contractor shall make provisions in the installation of its Work that noises or vibrations will not be transmitted through foundations, floors, walls, columns, ducts and piping, so as to be objectionable in any manner. All equipment provided shall be selected and installed with this in mind. If any equipment exceeds reasonable requirements as to quietness of operation and freedom from vibration when operating under continuous maximum demands, it shall be altered or replaced.

B. Furnish and install vibration eliminators and isolation equipment for equipment, motors etc. as specified in Section 230548.

C. The isolation and vibration eliminator manufacturer and Contractor shall be responsible for the selection of the proper units for their loadings, quantities and each shall guarantee that each and every installation and their application shall have a vibration efficiency of 95% or greater. As a minimum, provide types of vibration eliminators as specified in Section 230548.

D. Submit shop drawings to the Engineer for review of all isolation equipment with dimensions and other data as recommended and prepared by the isolation equipment manufacturer.

2.03 MAINTENANCE MATERIALS, SERVICE AND SPARE PARTS

A. Refer to the General Conditions and to the individual Sections for specific requirements.

B. Furnish the Engineer a written statement from the Owner certifying acceptance of the equipment data and instruction of the operators. Request for final payment will not be approved until this certificate has been submitted.

2.04 BUILDING STANDARDS

A. If building has standards for piping, ductwork, temperature controls, equipment, etc., provide same unless noted otherwise.

PART 3 - EXECUTION

3.01 SAFETY PRECAUTIONS DURING INSTALLATION

A. Contractor shall take all measures to ensure safe installation of all Work and to prevent injury to persons or damage to property in compliance with OSHA and all applicable regulations.

B. Contractor shall erect whatever scaffold, platforms, supports or other required construction to safely protect his own workers and other persons at the site.

C. Such scaffolds, platforms, etc., shall be designed and constructed by Contractor who shall be solely responsible for their adequacy and safety. Engineer and Owner are not responsible for ascertaining the adequacy of any temporary structures used or erected by the Contractor.

D. Identify all hazards such as low ductwork, low horizontal piping, low hangers, etc. below 6'-6" above floor according to OSHA low headroom marking standards. Protect personnel from all equipment, etc. that protrudes into the 6'-6" above floor zone with padded protective devices and identify as per OSHA standard markers.

3.02 RIGGING

A. All heavy machinery, equipment and heavy parts thereof shall be brought into or onto the building premises by a machinery moving company satisfactory to the Engineer. Machinery movers shall not rig, tie to or test weight upon any building member of any part of the building or premises or make use of any stairway. Permission to rig or in any way make use of any part of the building or premises, shall not relieve this contractor from responsibility for any damage resulting from or because of said rigging or use. No holes shall be cut in any roof, wall or floor for the introduction of machinery except when absolutely necessary and then only with prior approval of the Owner. Such holes will be cut and repaired by the proper trades at the expense of this contractor.

3.03 WORKMANSHIP AND MATERIALS

A. All materials shall be new and of first quality. All labor shall be executed in a neat, workmanlike manner and shall be performed by mechanics skilled in their respective trades. The Engineer shall decide all matters pertaining to the quality of workmanship and materials.

3.04 INTERRUPTIONS AND TIE-INS

A. Any interruptions and tie-ins to existing systems that are necessary for installation of the new Work shall be performed and completed in the time period specified in the Contract Documents or as allowed by local authorities and the Owner.

3.05 MODIFICATIONS AND INTERFERENCES

A. Contractor shall carefully check and become familiar with all Mechanical Drawings and Details. Make note of all locations where walls, partitions, ceilings and structural members are called for to be furred or closed-in.

B. Modifications to the arrangement of the piping systems may be required to suit structural conditions or to avoid interference with the Work of other trades. Contractor shall furnish all offsets, additional fittings, etc., as required to meet installation conditions whether detailed on the Drawings or not.

C. Any conflicting information in the Specifications or on the Drawings shall be called to the attention of the Engineer for clarification before proceeding with fabrication or erection of the parts affected. If, in the opinion of the Contractor, any additional detail drawings are necessary, Contractor shall prepare them at its own expense, together with all bills of material.

3.06 COOPERATION OF CONTRACTORS

A. Each Contractor, in the event of separate contracts in laying out his work, shall cooperate with other Contractors on the work so as to avoid any interference with their work. If this is not done, the Engineer reserves the right to make such changes in the work as are necessary to avoid interferences and such changes will not be considered as cause for additional compensation or extension of time for the Contractor.

B. Allow for a three (3) hour coordination meeting with all mechanical and electrical contractors prior to the start of the work.

3.07 JURISDICTION OF WORK

A. Where it becomes necessary for the Contractor, in order to fulfill his contract, to furnish labor or materials other than that which is generally accepted by trade agreement or general practice to belong to his particular trade or branches of work, the Contractor shall sublet same to Sub-contractor engaged in the type of work involved to the end that there will be no stoppage of work due to violations of trade agreements as to jurisdiction.

3.08 WORK PRIORITY OVER OTHER TRADES

A. The construction trades are to be governed as follows: Work in cooperation with one another to fit piping and ductwork into structure as job conditions may demand. All final decisions as to right of way and run of pipe, ducts, to be made by the Engineer.

3.09 ARRANGEMENT AND ALIGNMENT

A. All equipment, ductwork, piping, etc. shall be arranged and aligned in accordance with the Drawings. Elevations, where given, must be held. Floor elevations, where given, are to high points of floor. Dimensions must be held as closely as possible. All dimensions are to be field-verified for accuracy before fabrication.

B. Install all equipment, ductwork, piping, etc. straight and direct as possible, generally forming right angles with or running parallel with, walls or adjacent ductwork, piping, etc. All ductwork, piping, etc. shall be neatly spaced with risers and drops running plumb and true.

C. Run ductwork, piping, etc. in wall chases, shafts, hung ceilings, recesses, etc., where same are provided. Do not run in floor slab fill unless specifically so noted on Drawings. Ductwork, piping, etc. shall not be covered or closed until testing is completed.

D. Drawings, in general, are made to scale. All dimensions shall be checked in the field by the Contractor before final connections are fabricated.

E. Drawings are, in general, diagrammatic and the exact locations shall be determined by the Contractor from field measurements. The actual arrangement, when erected, shall follow the general locations shown on the Drawings as far as practicable. The installation shall be neat in appearance and convenient to operate.

F. Installations shall be coordinated with other Work to avoid blocking building openings, light fixtures, etc. and shall not interfere with access to valves or equipment. Equipment, ductwork, piping, etc. shall be installed to provide working clearance for operation and maintenance.

3.10 CLEARANCES

A. Install ductwork, piping, etc. to provide minimum clearance of at least 1" between extreme projections of piping, flanges, fittings, valves, allowing for insulation, expansion, etc.

3.11 EXPANSION

A. Special attention shall be given to the installation of ductwork, piping, etc. which have an appreciable movement so that they will not hit other ducts, pipes, structural members, etc. under actual operating conditions.

B. Provide flexible connections or expansion compensators where ducts, pipes, etc. cross building expansion joints.

3.12 CUTTING AND PATCHING

A. All cutting, repairing, fitting and refinishing of in-place construction required for the installation of the Work of a Section, shall be included as part of the Work of that section except as specifically shown on Drawings or hereinafter specified.

B. Work shall be performed by craftsmen skilled in their respective trades.

C. Match existing conditions in color, materials and texture.

3.13 SEALING OF DUCT AND PIPE OPENINGS

A. Calking: Calking compound required for sealing duct openings and pipe sleeves as hereinafter specified shall be butyl rubber base single-component, non-staining type:
   1. BC-158 Butyl Rubber Sealant; Pecora Chemical Co.
   2. DAP Butyl-Flex; DAP Inc.
   3. Hornseal; A.C. Horn Co.

B. Seals: In lieu of oakum and lead calking compound, expandable linked rubber seals with stainless steel bolts and nuts will be accepted (Thunderline Corp., "Link Seal"). In interior walls, sleeves shall be Schedule 40 pipe, and link seals and galvanized bolts and nuts.

C. Trim Plates: On all exposed pipes passing through floors, walls, partitions, plaster furring, etc., provide 1" (25 mm) split-type steel plates at visible sides of openings. In finished rooms, plates shall be prime coated; in unfinished rooms, plates shall be chrome plated.

3.14 DUCTWORK PIPE AND EQUIPMENT IDENTIFICATION

A. Piping identification shall be as specified in related section. Equipment identification consistent with the markings on the equipment schedule shall be made following finished painting with paint or stencil letters or numerals as approved by the Engineer.

3.15 CLEANING - GENERAL AREA

A. Contractor shall assist in maintaining the premises in an orderly fashion at all times, providing continuous clean-up during the construction period. Contractor shall remove all cartons, containers and crates as soon as their contents have been removed and shall also remove all debris caused by its Work as soon as possible. Deposit all discarded materials in a suitable refuse container and prevent these materials from being scattered by the elements. All cartons and debris shall be removed from the premises and site at the sole expense of the Contractor.

B. Contractor shall stack all construction materials associated with its Work in areas so as to avoid congestion and interference.

C. At the completion of the work, the Contractor shall clean all of his work and equipment free from dust and other foreign matter and shall leave the work in good housekeeping condition, in a manner acceptable to the Engineer.

3.16 TESTING, ADJUSTING AND BALANCING

A. Prior to testing, all equipment shall be properly lubricated in accordance with the manufacturer instructions. One (1) set of tools necessary for lubrication shall be provided by Contractor.

B. Except for small electrical motors which, under NEMA Standards, are equipped with lifetime lubrication, all bearings on large motors and mechanical equipment shall be equipped with lubrication fittings at all service points, accessibly located. Oil fill and drain line extensions shall be provided where necessary for convenient servicing of equipment.

C. Testing of each system shall be the responsibility of the trade installing the Work under the supervision of an Engineer employed by the Contractor except as specified:
   1. HVAC Contractor shall appoint and employ services of an independent firm to perform testing, adjusting and balancing.
      a. The independent firm will perform services specified in Section 230593.
      b. Reports will be submitted by the independent firm to the Engineer indicating observations and results of tests and indicating compliance or non-compliance with the requirements of the Contract Documents.

D. After the various systems are pressure tested and cleaned as herein before specified, the following tests shall be made in the presence of the Engineer. Five (5) day advance written notice of the tests shall be given to the Engineer who, in turn, will notify other interested parties. Furnish all gages, instruments, test equipment and personnel required for the tests. Adjust all equipment to perform with the least possible noise and vibration consistent with its duty. Quietness of operation of all equipment is a requirement. Any equipment producing noise that is abnormal, in the opinion of the Engineer, shall be repaired or removed and replaced with satisfactory equipment at no additional expense.

E. Operate the system and make all adjustments in control and equipment and complete necessary balancing to deliver not less than the air or fluid quantities shown on the Drawings for each equipment item.

3.17 TOOLS

A. On completion of the Work, the Contractor shall furnish and deliver to the Owner any special tools and instrumentation that may be required for the proper servicing or routine testing of any equipment furnished on the Contract.

END OF SECTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Demolition of existing systems, equipment or installations.

1.02 RELATED DOCUMENTS

A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions apply to work of this section.

B. Section 230010 - Mechanical General Requirements

1.03 DESCRIPTION OF WORK

A. Work includes demolition and removal of piping services, ductwork, etc. and all related accessories shown.

B. Demolition of air handling equipment, chilled water piping, ductwork, etc.; services related with the removal of building partitions, walls, etc. where indicated on the Drawings.

C. Where existing, pipe, fittings, equipment, ductwork and breechings are to be removed or disturbed which have been insulated with asbestos material; the Owner will remediate, in strict accordance with OSHA Regulations utilizing OSHA approved Contractors. Repair, replacement, or encapsulation of existing insulation containing asbestos shall be with new material as specified elsewhere. The Contractor is to coordinate sequencing and access with the Owner.

1.04 REGULATORY REQUIREMENTS

A. All work, materials and installations shall comply with local building codes and bear the UL label or be approved if applicable.

1.05 QUALIFICATIONS

A. Product manufacturer and installer shall have five (5) years experience in the production and installation of the materials specified herein.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 PROTECTION

A. All existing ductwork to remain shall be capped at the start of demolition to protect the galleries from construction dust and debris.

B. Perform demolition in such manner as to eliminate hazards to persons and property; to minimize interference with use of adjacent areas, utilities and structures or interruption of use of such utilities; and to provide free passage to and from such adjacent areas of structures.

C. Provide safeguards, including warning signs, barricades, temporary fences, warning lights and other similar items that are required for protection of all personnel during demolition and removal operations.

D. Fences, barricades, lights and other similar items around exposed excavations shall be maintained until such excavations have been completely filled.

E. Provide enclosed duct chutes with control gates from each floor to carry debris to truck beds and govern flow of material into truck. Provide overhead bridges of tight board or prefabricated metal construction at dust chutes to protect persons and property from falling debris.

F. Prevent spread of flying particles and dust.

G. In addition to previously listed fire and safety rules to be observed in performance of work include the following:

1. No piping, equipment, etc., or part of same shall be permitted to fall outwardly from structures.

2. Wherever a cutting torch or other equipment that might cause a fire is used, provide and maintain fire extinguishers nearby ready for immediate use. All possible users shall be instructed in use of fire extinguishers.
3. Hydrants shall be accessible at all times. No debris shall be permitted to accumulate within a radius of 15' of fire hydrants.

H. Protect all materials or equipment installed under this contract from all damage due to building operations, weather, etc. Contractor will be held strictly responsible for any damage incurred to materials, equipment, etc., due to his failure to take necessary precautions or providing proper protection. Take all necessary precautions to protect the work of others. In the event of damage to other work caused by this contractor, his employees or his apparatus, he shall have same repaired at this own expense. Provide temporary filters on existing return air ducts to protect them from gathering construction dust.

3.02 PIPING AND DUCTWORK SERVICES - DEMOLISH AND REMOVE PIPING AND DUCTWORK SERVICES AS FOLLOWS:

A. Piping and ductwork lines shown to be removed.

B. Abandoned portions of piping and ductwork capped off, located in areas of new remodeled areas in existing building.

C. Abandoned portions of piping, etc., within areas of existing building and where shown on the Drawings.

D. Abandoned piping, ductwork, etc., that would interfere with installation of new work.

E. Other abandoned lines not specified that interfere with performance of the work of this contract.

3.03 DEMOLITION

A. Take particular note of the revisions and alterations to the present site as well as alterations of existing system etc., due to the new structure, as indicated on the Drawings. Remove, reroute, or alter all piping, etc., of any kind of service which forms a part of his work, as required.
1. Cut back and remove piping, ductwork, etc., systems within building structure to points as required for extension and/or rerouting to clear new work shown on the Drawings.
2. Each Trade Contractor shall remove existing equipment and materials pertaining to his contract as specified or as required, whether shown on the Drawings or not, to prepare for the new work of all contracts.
3. Where necessary, reroute piping, ducts, etc. from within walls, floors, ceilings, etc. being removed. The Trade Contractor involved with the interrupted service shall be responsible for accomplishing the required work whether shown on the Drawings or not.
4. Cap all abandoned or terminated piping, etc. below floor, behind wall surface, above ceiling, etc. as required to be completely concealed after new work is complete.
5. In general, mechanical demolition remodeling work is shown on the Mechanical Drawings but carefully study all Drawings for all contracts of other trades for demolition/remodeling work in the existing buildings and field check to verify locations where such work is being done to determine the exact extent of work required. No extra will be allowed for additional work required because of demolition or remodeling whether or not work is specifically noted, itemized or shown on the Drawings.
6. Maintaining Present Services: Maintain all services in the existing building. This shall include all temporary or permanent piping connections, etc., required to provide and maintain services to the present buildings and the equipment served. In the case of change-over piping and ductwork or where new service connections are to be made to existing services and service interruptions can in no way be avoided, the service interruptions shall be with the minimum of inconvenience to the Owner. If the Owner directs that such work be performed during premium time hours then the Contractor shall be reimbursed for the premium time portion of the direct labor cost of the workmen actually performing the work. All costs (except for premium time portion of labor costs) incurred in order to comply with the foregoing shall be included in the Contractor's original bid for the work and without additional costs to the Owner.

7. Any holes or openings left in walls, roofs, floors, ceilings, etc., after required demolition removal of piping, ductwork, equipment, etc., shall be filled in and patched by this contractor in a manner approved by Engineer and Owner. Failure on this contractor's part to comply with above shall make him responsible for any extra expense involved.
8. Any equipment or architectural elements damaged or destroyed in the demolition work shall be repaired, replaced or brought back to good working order to the satisfaction of the owner and engineer.
9. Any refrigeration equipment that is to be removed, the refrigerant must first be evacuated and stored in containers before demolition. The refrigerant containers shall be turned over to the Owner. However, if the Owner decides the refrigerant is of no value to him, then they shall become the property of the Contractor who shall remove the refrigerant from the premises and dispose of same.

3.04 RELOCATION

A. Any existing equipment, piping, ductwork, etc., required to be relocated shall be relocated in full, including all new piping, ductwork, electrical, temperature control, insulation, etc., to provide a complete and working condition after the relocation.

3.05 DISPOSITION OF REMOVED EQUIPMENT

A. Where existing materials or equipment are specified to be removed from service, the Trade Contractor shall take possession of same and remove them from the site promptly, except as specified below or unless otherwise noted on Drawings.

B. All salvageable material and equipment, including but not necessarily limited to, electrical fixtures, conduit, wiring, plumbing fixtures, heating units, piping, valves, etc., shall be removed and maintained in as good condition as possible and turned over to the Owner. However, if the Owner decides any such materials are of no value to him then they shall become the property of the Contractor who shall remove such discarded work from the premises and dispose of same.

C. Existing equipment or systems etc. which are specified to be replaced by new equipment or systems, etc. shall not be removed from service until the new equipment; materials, systems, etc. have actually been installed and are operational in the Engineer's opinion unless necessitated by job progress or other unavoidable condition.

D. Existing refrigeration compressors that are to be removed shall be purged and sealed with nitrogen and shall be stored on the roof with weatherproof enclosures. However, if the compressors are of no value to the Owner, then they shall become the property of the Contractor who shall remove same from the premises and dispose of.

3.06 CLEAN-UP

A. On completion of work of this section and after removal of all debris, site shall be left in clean condition satisfactory to Project Coordinator. Clean-up shall include off the site disposal of all items and materials not required to remain property of the Owner as well as debris and rubbish resulting from demolition operations.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

B. Testing, adjustment, and balancing of hydronic and refrigerating systems.

C. Measurement of final operating condition of HVAC systems.

D. Sound measurement of equipment operating conditions.

E. Vibration measurement of equipment operating conditions.

F. Commissioning activities.

1.02 RELATED REQUIREMENTS

A. Section 01 9113 - General Commissioning Requirements: Commissioning requirements that apply to all types of work.

B. Section 23 0800 - Commissioning of HVAC.

1.03 REFERENCE STANDARDS

A. AABC MN-1 - AABC National Standards for Total System Balance; Associated Air Balance Council; 2002.

B. ASHRAE Std 111 - Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems; American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.; 1988, with 1997 Errata.

C. NEBB (TAB) - Procedural Standards for Testing Adjusting Balancing of Environmental Systems; National Environmental Balancing Bureau; 2005, Seventh Edition.

D. SMACNA (TAB) - HVAC Systems Testing, Adjusting, and Balancing; Sheet Metal and Air Conditioning Contractors' National Association; 2002.

1.04 SUBMITTALS

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

B. Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.

C. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
   1. Submit six weeks prior to starting the testing, adjusting, and balancing work.
   2. Include certification that the plan developer has reviewed the contract documents, the equipment and systems, and the control system with the McGuire Engineers, Inc. and other installers to sufficiently understand the design intent for each system.
   3. Include at least the following in the plan:
      a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
      b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
      c. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
      d. Final test report forms to be used.
      e. Specific procedures that will ensure that both air and water side are operating at the lowest possible pressures and methods to verify this.
      f. Confirmation of understanding of the outside air ventilation criteria under all conditions.
      g. Method of verifying and setting minimum outside air flow rate will be verified and set and for what level (total building, zone, etc.).

h. Method of checking building static and exhaust fan and/or relief damper capacity.
i. Methods for making coil or other system plant capacity measurements, if specified.
j. Time schedule for deferred or seasonal TAB work, if specified.
k. Procedures for formal deficiency reports, including scope, frequency and distribution.

D. Field Logs: Submit at least twice a week to Commissioning Authority.

E. Control System Coordination Reports: Communicate in writing to the controls installer all setpoint and parameter changes made or problems and discrepancies identified during TAB that affect, or could affect, the control system setup and operation.

F. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
1. Submit to the Commissioning Authority within two weeks after completion of testing, adjusting, and balancing.
2. Revise TAB plan to reflect actual procedures and submit as part of final report.
3. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for McGuire Engineers, Inc. and for inclusion in operating and maintenance manuals.
4. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
5. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
6. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
7. Units of Measure: Report data in both I-P (inch-pound) and SI (metric) units.
8. Include the following on the title page of each report:
a. Name of Testing, Adjusting, and Balancing Agency.
b. Address of Testing, Adjusting, and Balancing Agency.
c. Telephone number of Testing, Adjusting, and Balancing Agency.
d. Project name.
e. Project location.
f. Project Engineer.
g. Project Contractor.
h. Project altitude.
i. Report date.

G. Project Record Documents: Record actual locations of flow measuring stations and balancing valves and rough setting.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. Perform total system balance within the area of scope in accordance with one of the following:
1. AABC MN-1, AABC National Standards for Total System Balance.
2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
3. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems.
4. SMACNA HVAC Systems Testing, Adjusting, and Balancing.
5. 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. AABC, Associated Air Balance Council: www.aabchq.com; upon completion submit AABC National Performance Guaranty.
      b. NEBB, National Environmental Balancing Bureau: www.nebb.org.
      c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org.

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. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to McGuire Engineers, Inc. to facilitate spot checks during testing.

B. Provide additional balancing devices as required.

3.04 ADJUSTMENT TOLERANCES

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

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

C. Hydronic Systems: Adjust to within plus 10 percent or minus 5 percent of design.

3.05 RECORDING AND ADJUSTING

A. Ensure recorded data represents actual measured or observed conditions.

B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

E. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

F. Check and adjust systems approximately six months after final acceptance and submit report.

G. Patch holes in insulation, ductwork and housings, which have been cut or drilled for test purposes, in manner recommended by original installer.

H. Mark equipment settings, including damper control positions, valve indicators, fan speed control levers and similar controls and devices, to show final settings at completion of TAB work. Provide markings with paint or other suitable permanent identification materials.

I. Operate the heating and cooling systems and make all adjustments in controls and equipment and complete necessary balancing to deliver not less than the water quantities shown on the drawings at each equipment item.

J. Prepare a report of recommendations for correcting unsatisfactory mechanical performances when systems cannot be successfully balanced; including, where necessary, modifications which exceed requirements of Contract Documents for mechanical work.

K. Retest, adjust and balance systems subsequent to significant system modifications and resubmit test results.

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 (12.5 Pa) 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.

N. Coordinate with acoustical consultant, balance, owner, and mechanical engineer to determine appropriate maximum "show" mode fan speed for air handling units.

3.07 SCOPE

A. Test, adjust, and balance the following:
   1. Air Terminal Units
   2. Air Inlets and Outlets

3.08 MINIMUM DATA TO BE REPORTED

A. Duct Traverses:
   1. System zone/branch
   2. Duct size
   3. Area
   4. Design velocity
   5. Design air flow
   6. Test velocity
   7. Test air flow
   8. Duct static pressure
   9. Air temperature
   10. Air correction factor

B. Air Distribution Tests:
   1. Air terminal number
   2. Room number/location
   3. Terminal type
   4. Terminal size
   5. Area factor
   6. Design velocity
   7. Design air flow
   8. Test (final) air flow
   9. Percent of design air flow

C. Sound Level Reports:
   1. Location
   2. Octave bands - equipment off
   3. Octave bands - equipment on

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Duct insulation.

B. Duct liner.

C. Insulation jackets.

1.02 RELATED REQUIREMENTS

A. Section 23 3100 - HVAC Ducts and Casings: Glass fiber ducts.

1.03 REFERENCE STANDARDS

A. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2007.

B. ASTM B 209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate [Metric]; 2007.

C. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2004.

D. ASTM C 553 - Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2002.

E. ASTM C 612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2004.

F. ASTM C 1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2005.

G. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2008.

H. ASTM E 96/E 96M - Standard Test Methods for Water Vapor Transmission of Materials; 2005.

I. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.

J. SMACNA (DCS) - HVAC Duct Construction Standards - Metal and Flexible; Sheet Metal and Air Conditioning Contractors' National Association; 2005.

K. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Underwriters Laboratories Inc.; 2003.

1.04 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.

1.05 QUALITY ASSURANCE

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

B. Applicator Qualifications: Company specializing in performing the type of work specified in this section, with minimum five years of experience and approved by manufacturer.

C. Materials: Flame spread/smoke developed rating of 25/50 in accordance with ASTM E84, NFPA 255 and UL 723.

1.06 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.

1.07 FIELD CONDITIONS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.01 REQUIREMENTS FOR ALL PRODUCTS OF THIS SECTION

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

2.02 GLASS FIBER, FLEXIBLE (TYPE A) - WHERE MENTIONED IN KEY NOTES

A. Manufacturer:
   1. Knauf Insulation: www.knaufusa.com.
   2. Johns Manville Corporation: www.jm.com.
   3. Owens Corning Corp: www.owenscorning.com.
   4. CertainTeed Corporation; : www.certainteed.com.
   5. Substitutions: See Section 230010 - Product Requirements.

B. Insulation: ASTM C 553; flexible, noncombustible blanket.
   1. 'K' ('Ksi') value: 0.36 at 75 degrees F (0.052 at 24 degrees C), when tested in accordance with ASTM C 518.
   2. Maximum Service Temperature: 450 degrees F (232 degrees C).
   3. Maximum Water Vapor Sorption: 5.0 percent by weight.

C. Vapor Barrier Jacket:
   1. Kraft paper with glass fiber yarn and bonded to aluminized film.
   2. Moisture Vapor Permeability: 0.02 perm inch (0.029 ng/Pa s m), when tested in accordance with ASTM E 96/E 96M.
   3. Secure with pressure sensitive tape.

D. Vapor Barrier Tape:
   1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

2.03 GLASS FIBER, RIGID (TYPE B)

A. Manufacturer:
   1. Knauf Insulation: www.knaufusa.com.
   2. Johns Manville Corporation: www.jm.com.
   3. Owens Corning Corp: www.owenscorning.com.
   4. CertainTeed Corporation: www.certainteed.com.
   5. Substitutions: See Section 01600 - Product Requirements.

B. Insulation: ASTM C 612; rigid, noncombustible blanket.
   1. 'K' ('Ksi') value: 0.24 at 75 degrees F (0.036 at 24 degrees C), when tested in accordance with ASTM C 518.
   2. Maximum service temperature: 450 degrees F (232 degrees C).
   3. Maximum Water Vapor Sorption: 5.0 percent.
   4. Maximum Density: 8.0 lb/cu ft (128 kg/cu m).

C. Vapor Barrier Jacket:
   1. Kraft paper with glass fiber yarn and bonded to aluminized film.

2. Moisture Vapor Permeability: 0.02 perm inch (0.029 ng/Pa s m), when tested in accordance with ASTM E 96/E 96M.
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.

E. Indoor Vapor Barrier Finish:
1. Vinyl emulsion type acrylic, compatible with insulation, black color.

2.04 GLASS FIBER DUCT LINER, FLEXIBLE (TYPE D)

A. Manufacturers:
1. Knauf Sonic Performance+ Duct Liner with ECOSE® Technology.
2. Other acceptable manufacturers offering equivalent products:
a. Owens-Corning Fiberglass Corp., “Aeroflex Plus”.
b. Manville Mechanical Insulations.
c. Certainteed.

B. Insulation: ASTM C553; flexible, noncombustible blanket with protective black coating on air surface.
1. 'K' ('Ksi') Value: ASTM C518, 0.28 at 75EF (0.04 at 24EC). Minimum R-6 at 1.5" thickness.
2. Maximum Service Temperature: 250EF (121EC).
3. Density: 1.5 lb/cu. ft. (24 kg/cu m).
4. Maximum Velocity on Coated Air Side: 6,000/min (30.5 m/sec).
5. Fire Classification: UL 723, NFPA 255, 90A and 90B; flame spread - 25, smoke development - 50.

C. Adhesive: Waterproof fire-retardant type.

D. Liner Fasteners: Galvanized steel, impact applied or welded with integral, press on head suitable for application as recommended by manufacturer. Adhesive bonded pins are not acceptable.

2.05 JACKETS

A. Canvas Jacket: UL listed 6 oz/sq yd (220 g/sq m) plain weave cotton fabric treated with dilute fire retardant lagging adhesive.

B. Mineral Fiber (Outdoor) Jacket: Asphalt impregnated and coated sheet, 50 lb/square (2.45 kg/sq m).

C. Aluminum Jacket: ASTM B 209 (ASTM B 209M).
1. Thickness: 0.016 inch (0.40 mm) sheet.
2. Finish: Smooth.
3. Joining: Longitudinal slip joints and 2 inch (50 mm) laps.
4. Fittings: 0.016 inch (0.4 mm) thick die shaped fitting covers with factory attached protective liner.
5. Metal Jacket Bands: 3/8 inch (10 mm) wide; 0.015 inch (0.38 mm) thick aluminum.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that ducts have been tested before applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install in accordance with NAIMA National Insulation Standards.

C. Insulated ducts conveying air below ambient temperature:
   1. Provide insulation with vapor barrier jackets.
   2. Finish with tape and vapor barrier jacket.
   3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
   4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

D. Insulated ducts conveying air above ambient temperature:
   1. Provide with or without standard vapor barrier jacket.
   2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

E. Ducts Exposed in Mechanical Equipment Rooms or Finished Spaces (below 10 feet (3 meters) above finished floor): Finish with canvas jacket sized for finish painting.

F. Exterior Applications: Provide insulation with vapor barrier jacket. Cover with outdoor jacket finished as specified in Section 230713 2.05 C Aluminum jacket.

G. External Duct Insulation Application:
   1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
   2. Secure insulation without vapor barrier with staples, tape, or wires.
   3. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
   4. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
   5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

H. Duct and Plenum Liner Application:
   1. Adhere insulation with adhesive for 90 percent coverage.
   2. Secure insulation with mechanical liner fasteners. Refer to SMACNA HVAC Duct Construction Standards - Metal and Flexible for spacing.
   3. Seal and smooth joints. Seal and coat transverse joints.
   4. Seal liner surface penetrations with adhesive.
   5. Duct dimensions indicated are net inside dimensions required for air flow. Increase duct size to allow for insulation thickness.

3.03 TOLERANCE

A. Substituted insulation materials shall provide thermal resistance within 10% at normal conditions, as materials indicated.

3.04 SCHEDULES

A. See table below:

B. Supply Air Ducts (interior), liner: 1 inches (38 mm) thick. Minimum R-4 type D.

C. Return Air Ducts located in unconditioned areas: 1" thick.

D. Small Plenums (Supply or Return) at registers or grilles: Minimum R-4 type D.

E. Transfer Ducts: 1 inch (25 mm) thick. Type D.

Ductwork	Type	Thickness (min.)	R-value (min.)
Supply Air Ducts (interior) liner	D	1.5"	R-6
Stage Ductwork downstream of motorized dampers (ATF-1 system)	Duct board where possible, otherwise Type A. Bid alternate: provide Endura-Duct	3"	R-12

All return ducts located in unconditioned areas (ceiling plenums)	D	1"	
All Supply and Return ductwork in Mechanical Rooms	D	1"	R-6
Exhaust Ductwork	D	1"	
Outside Air Ductwork (interior)	B	2" (50 mm)	R-12
Transfer Ducts	D	1"	
Supply, Return and Outside Air ducts (exterior)	B plus D	1-1/2" (38 mm) plus 1-1/2" (38 mm)	R-12

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Diffusers:
   1. Rectangular ceiling diffusers.

B. Registers/grilles:
   1. Ceiling-mounted, exhaust and return register/grilles.
   2. Wall-mounted, exhaust and return register/grilles.

C. Duct-mounted supply and return registers/louvers.

1.02 REFERENCE STANDARDS

A. AHRI 880 (I-P) - Performance Rating of Air Terminals; 2011 with Addendum 1.

B. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; 2023.

C. AMCA 511 - Certified Ratings Program for Air Control Devices; 2010.

D. ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Inlets; 2006 (Reaffirmed 2011).

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

F. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2017.

G. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2013.

H. UL 2518 - Standard for Safety Air Dispersion Systems; Current Edition, Including All Revisions.

I. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

J. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2015.

K. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

L. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2005 (Rev. 2009).

1.03 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

C. Project Record Documents: Record actual locations of air outlets and inlets.

1.04 QUALITY ASSURANCE

A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.

B. Test and rate louver performance in accordance with AMCA 500-L.

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

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Hart & Cooley, Inc: www.hartandcooley.com/#sle.

B. Price Industries: www.price-hvac.com/#sle.

C. Titus, a brand of Air Distribution Technologies: www.titus-hvac.com/#sle.

2.02 LOUVERS

A. Manufacturers:
   1. NCA, a brand of Metal Industries Inc: www.ncamfg.com/#sle.
   2. Ruskin Company: www.ruskin.com/#sle.
   3. Substitutions: See Section 016000 - Product Requirements.

B. Type: 4 inch (100 mm) deep frame with blades on 45 degree slope with center baffle and return bend, heavy channel frame, 1/2 inch (13 mm) square mesh screen over intake or exhaust end.

C. Fabrication: 16 gage, 0.0598 inch (1.52 mm) thick galvanized steel thick galvanized steel welded assembly, with factory prime coat finish.

D. Color: As indicated on the drawings.

E. Mounting: Furnish with interior flat flange for installation.

2.03 GOOSENECKS

A. Fabricate in accordance with SMACNA (DCS) of minimum 18 gage, 0.0598 inch (1.21 mm) galvanized steel.

B. Mount on minimum 12 inch (300 mm) high curb base where size exceeds 9 by 9 inch (230 by 230 mm).

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Comply with SMACNA (ASMM) for flashing/counter-flashing of roof penetrations and supports for roof curbs and roof mounted equipment.

C. Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.

D. Install diffusers to ductwork with air tight connection.

E. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.

F. Paint ductwork visible behind air outlets and inlets matte black. Refer to Section 099123.

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 that abandoned wiring and equipment serve only abandoned facilities.

B. Report discrepancies to Owner before disturbing existing installation.

C. Report discrepancies to Architect before disturbing existing installation.

D. 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.

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.

3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Remove, relocate, and extend existing installations to accommodate new construction.

B. Remove abandoned wiring to source of supply.

C. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.

D. 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.

E. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

F. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.

G. Repair adjacent construction and finishes damaged during demolition and extension work.

H. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.

I. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

3.04 CLEANING AND REPAIR

A. See Section 017419 - 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

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Single conductor building wire.

B. Underground feeder and branch-circuit cable.

C. Wiring connectors.

D. Electrical tape.

E. Oxide inhibiting compound.

F. Wire pulling lubricant.

G. Cable ties.

H. Firestop sleeves.

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

B. Section 260505 - Selective Demolition for Electrical: Disconnection, removal, and/or extension of existing electrical conductors and cables.

C. Section 260526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.

D. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

E. Section 262100 - Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conductors.

F. Section 284600 - Fire Detection and Alarm: Fire alarm system conductors and cables.

G. Section 312316 - Excavation.

H. Section 312316.13 - Trenching: Excavating, bedding, and backfilling.

I. Section 312323 - Fill: Bedding and backfilling.

1.03 REFERENCE STANDARDS

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2018).

B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011 (Reapproved 2017).

C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010 (Reapproved 2014).

D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2014).

E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2017.

F. ASTM D4388 - Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes; 2013.

G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

H. NECA 120 - Standard for Installing Armored Cable (AC) and Metal-Clad Cable (MC); 2012.

I. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2009.

J. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

L. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.

M. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.

N. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.

O. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.

P. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.

Q. UL 493 - Thermoplastic-Insulated Underground Feeder and Branch-Circuit Cables; Current Edition, Including All Revisions.

R. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.

S. UL 854 - Service-Entrance Cables; Current Edition, Including All Revisions.

T. UL 1569 - Metal-Clad Cables; Current Edition, Including All Revisions.

U. CEC - Chicago Electrical Code

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
   2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
   3. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.

B. Field Quality Control Test Reports.

C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

D. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.

1.06 QUALITY ASSURANCE

A. Conform to requirements of CEC.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

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

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

1.08 FIELD CONDITIONS

A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F (-10 degrees C), unless otherwise permitted by manufacturer's instructions.

When installation below this temperature is unavoidable, notify Architect and obtain direction before proceeding with work.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.

C. Nonmetallic-sheathed cable is not permitted.

D. Service entrance cable is permitted only as follows:
   1. Where not otherwise restricted, may be used:
      a. For underground service entrance, installed in raceway.

E. Armored cable is not permitted.

F. Metal-clad cable is permitted only as follows:
   1. Where not otherwise restricted, may be used:
      a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.
         1) Maximum Length: 6 feet (1.8 m).

G. Manufactured wiring systems are permitted only as follows:
   1. As part of UL listed modular office furniture systems. All other uses are not permitted.

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Provide new conductors and cables manufactured not more than one year prior to installation.

D. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.

E. Comply with NEMA WC 70.

F. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

G. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

H. Conductors and Cables Installed Exposed in Spaces Used for Environmental Air (only where specifically permitted): Plenum rated, listed and labeled as suitable for use in return air plenums.

I. Conductor Material:
   1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
   2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
   3. Tinned Copper Conductors: Comply with ASTM B33.

J. Minimum Conductor Size:
   1. Branch Circuits: 12 AWG.
      a. Exceptions:
         1) 20 A, 120 V circuits longer than 75 feet (23 m): 10 AWG, for voltage drop.
         2) 20 A, 277 V circuits longer than 150 feet (46 m): 10 AWG, for voltage drop.
   2. Control Circuits: 14 AWG.

K. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

L. Conductor Color Coding:
1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
2. Color Coding Method: Integrally colored insulation.
a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
3. Color Code:
a. 208Y/120 V, 3 Phase, 4 Wire System:
1) Phase A: Black.
2) Phase B: Red.
3) Phase C: Blue.
4) Neutral/Grounded: White.
b. Equipment Ground, All Systems: Green.
c. Isolated Ground, All Systems: Green with yellow stripe.
d. Travelers for 3-Way and 4-Way Switching: Pink.
e. For modifications or additions to existing wiring systems, comply with existing color code when existing code complies with NFPA 70 and is approved by the authority having jurisdiction.
f. For control circuits, comply with manufacturer's recommended color code.

2.03 SINGLE CONDUCTOR BUILDING WIRE

A. Manufacturers:
1. Copper Building Wire:
a. Cerro Wire LLC: www.cerrowire.com/#sle.
b. Encore Wire Corporation: www.encorewire.com/#sle.
c. General Cable Technologies Corporation; _____: www.generalcable.com/#sle.
d. Southwire Company: www.southwire.com/#sle.

B. Description: Single conductor insulated wire.

C. Conductor Stranding:
1. Feeders and Branch Circuits:
a. Size 10 AWG and Smaller: Solid.
b. Size 8 AWG and Larger: Stranded.
2. Control Circuits: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation:
1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
a. Size 4 AWG and Larger: Type XHHW-2.
b. Installed Underground: Type XHHW-2.
c. Fixture Wiring Within Luminaires: Type TFFN/TFN for luminaires with labeled maximum temperature of 90 degrees C; Approved suitable type for luminaires with labeled maximum temperature greater than 90 degrees C.

2.04 SERVICE ENTRANCE CABLE

A. Manufacturers:
1. Copper Service Entrance Cable:
a. Cerro Wire LLC: www.cerrowire.com/#sle.
b. Encore Wire Corporation: www.encorewire.com/#sle.
c. Southwire Company: www.southwire.com/#sle.

B. Service Entrance Cable for Underground Use: NFPA 70, Type USE single-conductor cable listed and labeled as complying with UL 854, Type USE-2, and with UL 44 Type RHH/RHW-2.

C. Conductor Stranding: Stranded.

D. Insulation Voltage Rating: 600 V.

2.05 METAL-CLAD CABLE

A. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.

B. Conductor Stranding:
   1. Size 10 AWG and Smaller: Solid.
   2. Size 8 AWG and Larger: Stranded.

C. Insulation Voltage Rating: 600 V.

D. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.

E. Grounding: Full-size integral equipment grounding conductor.

F. Armor: Steel, interlocked tape.

2.06 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

B. Connectors for Grounding and Bonding: Comply with Section 260526.

C. Wiring Connectors for Splices and Taps:
   1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
   2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.

D. Wiring Connectors for Terminations:
   1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
   2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
   3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
   4. Provide motor pigtail connectors for connecting motor leads in order to facilitate disconnection.
   5. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
   6. Aluminum Conductors: Use compression connectors for all connections.
   7. Stranded Conductors Size 10 AWG and Smaller: Use crimped terminals for connections to terminal screws.
   8. Conductors for Control Circuits: Use crimped terminals for all connections.

E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.

F. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.

G. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F (105 degrees C) for standard applications and 302 degrees F (150 degrees C) for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.

H. Mechanical Connectors: Provide bolted type or set-screw type.
   1. Manufacturers:
      a. Burndy LLC; _____: www.burndy.com/#sle.
      b. Ilsco: www.ilsco.com/#sle.
      c. Thomas & Betts Corporation: www.tnb.com/#sle.

I. Compression Connectors: Provide circumferential type or hex type crimp configuration.

1. Manufacturers:
   a. Burndy LLC: www.burndy.com/#sle.
   b. Ilsco: www.ilsco.com/#sle.
   c. Thomas & Betts Corporation: www.tnb.com/#sle.

J. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.
   1. Manufacturers:
      a. Burndy LLC: www.burndy.com/#sle.
      b. Ilsco: www.ilsco.com/#sle.
      c. Thomas & Betts Corporation: www.tnb.com/#sle.

2.07 WIRING ACCESSORIES

A. Electrical Tape:
   1. Manufacturers:
      a. 3M: www.3m.com/#sle.
      b. Plymouth Rubber Europa: www.plymouthrubber.com/#sle.
   2. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
   3. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F (-18 degrees C) and suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
   4. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil (0.76 mm); suitable for continuous temperature environment up to 194 degrees F (90 degrees C) and short-term 266 degrees F (130 degrees C) overload service.
   5. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil (3.2 mm); suitable for continuous temperature environment up to 176 degrees F (80 degrees C).
   6. Varnished Cambric Electrical Tape: Cotton cambric fabric tape, with or without adhesive, oil-primed and coated with high-grade insulating varnish; minimum thickness of 7 mil (0.18 mm); suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
   7. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, all-weather vinyl backing; minimum thickness of 90 mil (2.3 mm).

B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.
   1. Manufacturers:
      a. 3M: www.3m.com/#sle.
      b. Burndy LLC: www.burndy.com/#sle.
      c. Thomas & Betts Corporation: www.tnb.com/#sle.

C. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.
   1. Manufacturers:
      a. Burndy LLC: www.burndy.com/#sle.
      b. Ideal Industries, Inc: www.idealindustries.com/#sle.
      c. Ilsco: www.ilsco.com/#sle.

D. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.
   1. Manufacturers:
      a. 3M: www.3m.com/#sle.

b. American Polywater Corporation: www.polywater.com/#sle.
c. Ideal Industries, Inc: www.idealindustries.com/#sle.

E. Cable Ties: Material and tensile strength rating suitable for application.
1. Manufacturers:
a. Burndy LLC: www.burndy.com/#sle.

F. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for cables and roofing system to be installed; designed to accommodate existing penetrations where applicable.
1. Products:
a. Menzies Metal Products; Electrical Roof Stack and Cap: www.menzies-metal.com/#sle.
b. Menzies Metal Products; Electrical Retro Box: www.menzies-metal.com/#sle.

G. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.
1. Products:
a. HoldRite, a brand of Reliance Worldwide Corporation; HydroFlame Pro Series/HydroFlame Custom Built: www.holdrite.com/#sle.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that work likely to damage wire and cable has been completed.

C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.

D. Verify that field measurements are as indicated.

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

3.02 PREPARATION

A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.03 INSTALLATION

A. Circuiting Requirements:
1. Unless dimensioned, circuit routing indicated is diagrammatic.
2. When circuit destination is indicated without specific routing, determine exact routing required.
3. Arrange circuiting to minimize splices.
4. Include circuit lengths required to install connected devices within 10 ft (3.0 m) of location indicated.
5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
6. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
7. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is not permitted.
8. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.
9. Provide oversized neutral/grounded conductors where indicated and as specified below.
a. Provide 200 percent rated neutral for feeders fed from K-rated transformers.

b. Provide 200 percent rated neutral for feeders serving panelboards with 200 percent rated neutral bus.

B. Install products in accordance with manufacturer's instructions.

C. Perform work in accordance with NECA 1 (general workmanship).

D. Install metal-clad cable (Type MC) in accordance with NECA 120.

E. Installation in Raceway:
1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
2. Pull all conductors and cables together into raceway at same time.
3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

F. Exposed Cable Installation (only where specifically permitted):
1. Route cables parallel or perpendicular to building structural members and surfaces.
2. Protect cables from physical damage.

G. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

H. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.

I. Terminate cables using suitable fittings.
1. Metal-Clad Cable (Type MC):
a. Use listed fittings.
b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.

J. Install conductors with a minimum of 12 inches (300 mm) of slack at each outlet.

K. Where conductors are installed in enclosures for future termination by others, provide a minimum of 5 feet (1.5 m) of slack.

L. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

M. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

N. Make wiring connections using specified wiring connectors.
1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
3. Do not remove conductor strands to facilitate insertion into connector.
4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

O. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.

1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
   a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
   b. For taped connections likely to require re-entering, including motor leads, first apply varnished cambric electrical tape, followed by adequate amount of rubber splicing electrical tape, followed by outer covering of vinyl insulating electrical tape.
2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
   a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
   b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.
3. Wet Locations: Use heat shrink tubing.

P. Insulate ends of spare conductors using vinyl insulating electrical tape.

Q. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.

R. Identify conductors and cables in accordance with Section 260553.

S. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

3.04 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.
   1. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.

C. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Grounding and bonding requirements.

B. Conductors for grounding and bonding.

C. Connectors for grounding and bonding.

D. Ground bars.

E. Ground rod electrodes.

F. Ground plate electrodes.

G. Ground enhancement material.

1.02 RELATED REQUIREMENTS

A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.

B. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

C. Section 265600 - Exterior Lighting: Additional grounding and bonding requirements for pole-mounted luminaires.

1.03 REFERENCE STANDARDS

A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System; 2012.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; 2007.

D. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Verify exact locations of underground metal water service pipe entrances to building.
   2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
   3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.

B. Shop Drawings:
   1. Indicate proposed arrangement for signal reference grids. Include locations of items to be bonded and methods of connection.

C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

A. Do not use products for applications other than as permitted by NFPA 70 and product listing.

B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

D. Grounding System Resistance:
   1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.
   2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.
   3. Between Grounding Electrode System and Major Electrical Equipment Frames, System Neutral, and Derived Neutral Points: Not greater than 0.5 ohms, when tested using "point-to-point" methods.

E. Grounding Electrode System:
   1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
      a. Provide continuous grounding electrode conductors without splice or joint.
      b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
   2. Metal Underground Water Pipe(s):
      a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet (3.0 m) at an accessible location not more than 5 feet (1.5 m) from the point of entrance to the building.
      b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.
      c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.
   3. Metal In-Ground Support Structure:
      a. Provide connection to metal in-ground support structure that is in direct contact with earth in accordance with NFPA 70.
   4. Concrete-Encased Electrode:
      a. Provide connection to concrete-encased electrode consisting of not less than 20 feet (6.0 m) of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.
   5. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.
   6. Ground Bar: Provide ground bar, separate from service equipment enclosure, for common connection point of grounding electrode system bonding jumpers as permitted in NFPA 70. Connect grounding electrode conductor provided for service-supplied system grounding to this ground bar.
      a. Ground Bar Size: 1/4 by 2 by 12 inches (6 by 50 by 300 mm) unless otherwise indicated or required.

b. Where ground bar location is not indicated, locate in accessible location as near as possible to service disconnect enclosure.
c. Ground Bar Mounting Height: 18 inches (450 mm) above finished floor unless otherwise indicated.

F. Bonding and Equipment Grounding:
1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.

G. Isolated Ground System:
1. Where isolated ground receptacles or other isolated ground connections are indicated, provide separate isolated/insulated equipment grounding conductors.
2. Connect isolated/insulated equipment grounding conductors only to separate isolated/insulated equipment ground busses.
3. Connect the isolated/insulated equipment grounding conductors to the solidly bonded equipment ground bus only at the service disconnect or separately derived system disconnect. Do not make any other connections between isolated ground system and normal equipment ground system on the load side of this connection.

2.02 GROUNDING AND BONDING COMPONENTS

A. General Requirements:
1. Provide products listed, classified, and labeled as suitable for the purpose intended.
2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 260526:
1. Use insulated copper conductors unless otherwise indicated.
a. Exceptions:
1) Use bare copper conductors where installed underground in direct contact with earth.
2) Use bare copper conductors where directly encased in concrete (not in raceway).

C. Connectors for Grounding and Bonding:
1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.

D. Ground Bars:
1. Description: Copper rectangular ground bars with mounting brackets and insulators.
2. Size: As indicated.
3. Holes for Connections: As indicated or as required for connections to be made.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that work likely to damage grounding and bonding system components has been completed.

B. Verify that field measurements are as indicated.

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

3.02 INSTALLATION

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

B. Perform work in accordance with NECA 1 (general workmanship).

C. Make grounding and bonding connections using specified connectors.
   1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
   2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
   3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
   4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
   5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

D. Identify grounding and bonding system components in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS except Section 4.

B. Perform inspections and tests listed in NETA ATS, Section 7.13.

C. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.

D. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 055000 - Metal Fabrications: Materials and requirements for fabricated metal supports.

C. Section 260533.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.

D. Section 260533.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.

E. Section 265100 - Interior Lighting: Additional support and attachment requirements for interior luminaires.

F. Section 265600 - Exterior Lighting: Additional support and attachment requirements for exterior luminaires.

1.03 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2023.

C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.

D. MFMA-4 - Metal Framing Standards Publication; 2004.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate sizes and arrangement of supports and bases with actual equipment and components to be installed.
   2. Coordinate work to provide additional framing and materials required for installation.
   3. Coordinate compatibility of support and attachment components with mounting surfaces at installed locations.
   4. Coordinate arrangement of supports with ductwork, piping, equipment and other potential conflicts.
   5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install products on or provide attachment to concrete surfaces until concrete has cured; see Section 033000.

1.05 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel/strut framing systems, nonpenetrating rooftop supports, and post-installed concrete/masonry anchors.

B. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.

C. Installer's qualification statement.

D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.06 QUALITY ASSURANCE

A. Maintain at project site one copy of each referenced document that prescribes execution requirements.

B. Installer Qualifications for Powder-Actuated Fasteners: Certified by fastener system manufacturer with current operator's license.

C. Installer Qualifications for Field Welding: See Section 055000.

D. Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:
   1. Comply with the following. Where requirements differ, comply with most stringent.
      a. NFPA 70.
      b. Applicable building code.
      c. Requirements of authorities having jurisdiction.
   2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of electrical work.
   3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.
   4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for load to be supported with minimum safety factor of _____. Include consideration for vibration, equipment operation, and shock loads where applicable.
   5. Do not use products for applications other than as permitted by NFPA 70 and product listing.
   6. Steel Components: Use corrosion-resistant materials suitable for environment where installed.
      a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
      b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Conduit and Cable Supports: Straps and clamps suitable for conduit or cable to be supported.
   1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
   2. Conduit Clamps: Bolted type unless otherwise indicated.
   3. Products:
      a. Gripple, Inc; Universal Bracket: www.gripple.com/#sle.
      b. Gripple, Inc; Fast Trak: www.gripple.com/#sle.
      c. Gripple, Inc; Universal Clamp (Threaded): www.gripple.com/#sle.
      d. Gripple, Inc; Low Profile Bracket Kits: www.gripple.com/#sle.

C. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.
   1. Manufacturers:
      a. ABB: www.electrification.us.abb.com/#sle.
      b. Eaton Corporation: www.eaton.com/#sle.
      c. Emerson Electric Co; O-Z/Gedney: www.emerson.com/#sle.

d. HoldRite, a brand of Reliance Worldwide Corporation: www.holdrite.com/#sle.
e. nVent; Caddy: www.nvent.com/#sle.

D. Metal Channel/Strut Framing Systems:
1. Manufacturers:
a. ABB: www.electrification.us.abb.com/#sle.
b. Atkore International Inc; Unistrut: www.unistrut.us/#sle.
c. Custom Strut and Roll Forming, LLC; _____: www.customstrut.com/#sle.
d. Eaton Corporation: www.eaton.com/#sle.
e. Elgen Manufacturing Company, Inc; _____: www.elgenmfg.com/#sle.
2. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
3. Comply with MFMA-4.

E. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.

F. Anchors and Fasteners:
1. Manufacturers - Mechanical Anchors:
a. Dewalt: anchors.dewalt.com/#sle.
b. Hilti, Inc: www.hilti.com/#sle.
c. ITW Red Head, a division of Illinois Tool Works, Inc: www.itwredhead.com/#sle.
d. Simpson Strong-Tie Company Inc: www.strongtie.com/#sle.
2. Manufacturers - Powder-Actuated Fastening Systems:
a. Dewalt: anchors.dewalt.com/#sle.
b. Hilti, Inc: www.hilti.com/#sle.
c. ITW Ramset, a division of Illinois Tool Works, Inc: www.ramset.com/#sle.
3. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.
4. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
5. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
6. Hollow Masonry: Use toggle bolts.
7. Hollow Stud Walls: Use toggle bolts.
8. Sheet Metal: Use sheet metal screws.
9. Wood: Use wood screws.
10. Plastic and lead anchors are not permitted.
11. Powder-actuated fasteners are not permitted.
12. Hammer-driven anchors and fasteners are not permitted.
13. Preset Concrete Inserts: Continuous metal channel/strut and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
a. Manufacturer: Same as manufacturer of metal channel/strut framing system.
b. Comply with MFMA-4.
c. Channel Material: Use galvanized steel.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

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

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

3.02 INSTALLATION

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

B. Install hangers and supports in accordance with NECA 1.

C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.

E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.

F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G. Equipment Support and Attachment:
   1. Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.
   2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
   3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
   4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

H. Conduit Support and Attachment: See Section 260533.13 for additional requirements.

I. Box Support and Attachment: See Section 260533.16 for additional requirements.

J. Interior Luminaire Support and Attachment: See Section 265100 for additional requirements.

K. Exterior Luminaire Support and Attachment: See Section 265600 for additional requirements.

L. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.

M. Secure fasteners in accordance with manufacturer's recommended torque settings.

N. Remove temporary supports.

3.03 FIELD QUALITY CONTROL

A. Inspect support and attachment components for damage and defects.

B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).
B. Aluminum rigid metal conduit (RMC).
C. Intermediate metal conduit (IMC).
D. Flexible metal conduit (FMC).
E. Electrical metallic tubing (EMT).
F. Rigid polyvinyl chloride (PVC) conduit.
G. Electrical nonmetallic tubing (ENT).
H. Conduit fittings.
I. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.
B. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Metal clad cable (Type MC), armored cable (Type AC), and manufactured wiring systems, including uses permitted.
C. Section 260526 - Grounding and Bonding for Electrical Systems.
D. Section 260529 - Hangers and Supports for Electrical Systems.
E. Section 260533.16 - Boxes for Electrical Systems.
F. Section 260553 - Identification for Electrical Systems: Identification products and requirements.
G. Section 262100 - Low-Voltage Electrical Service Entrance: Additional requirements for electrical service conduits.

1.03 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2015.
B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2015.
C. ANSI C80.5 - American National Standard for Electrical Rigid Metal Conduit -- Aluminum (ERMC-A); 2015.
D. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit (EIMC); 2005.
E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.
F. NECA 102 - Standard for Installing Aluminum Rigid Metal Conduit; 2004.
G. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2003.
H. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
I. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2013.
J. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2016.
K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
L. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.
M. UL 6A - Electrical Rigid Metal Conduit-Aluminum, Red Brass, and Stainless Steel; Current Edition, Including All Revisions.
N. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.

O. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.

P. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
   2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
   3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.
   4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.
   5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

1.05 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.

C. Underground:
   1. Under Slab on Grade: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
   2. Exterior, Embedded Within Concrete: Use galvanized steel rigid metal conduit, intermediate metallic conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
   3. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from underground.

4. Where rigid polyvinyl (PVC) conduit larger than 2 inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit elbows for bends.

D. Embedded Within Concrete:
   1. Within Slab on Grade (within structural slabs only where approved by Structural Engineer) : Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or reinforced thermosetting resin conduit (RTRC).

E. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

F. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

G. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit.

H. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

I. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).
   1. Locations subject to physical damage include, but are not limited to:
      a. Where exposed below 8 feet (2.4 m), except within electrical and communication rooms or closets.

J. Exposed, Exterior: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or PVC-coated galvanized steel rigid metal conduit.

K. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).

L. Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit.
   1. Maximum Length: 6 feet (1.8 m).

M. Connections to Vibrating Equipment:
   1. Dry Locations: Use flexible metal conduit.
   2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
   3. Maximum Length: 6 feet (1.8 m) unless otherwise indicated.
   4. Vibrating equipment includes, but is not limited to:
      a. Transformers.
      b. Motors.

2.02 CONDUIT REQUIREMENTS

A. Existing Work: Where existing conduits are indicated to be reused, they may be reused only where they comply with specified requirements, are free from corrosion, and integrity is verified by pulling a mandrel through them.

B. Electrical Service Conduits: Also comply with Section 262100.

C. Fittings for Grounding and Bonding: Also comply with Section 260526.

D. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.

E. Provide products listed, classified, and labeled as suitable for the purpose intended.

F. Minimum Conduit Size, Unless Otherwise Indicated:
   1. Branch Circuits: 3/4 inch (21 mm) trade size.
   2. Branch Circuit Homeruns: 3/4 inch (21 mm) trade size.
   3. Flexible Connections to Luminaires: 3/8 inch (12 mm) trade size.
   4. Underground, Interior: 3/4 inch (21 mm) trade size.
   5. Underground, Exterior: 1 inch (27 mm) trade size.

2.03 ALUMINUM RIGID METAL CONDUIT (RMC)

A. Manufacturers:

1. Allied Tube & Conduit: www.alliedeg.com/#sle.
2. Republic Conduit: www.republic-conduit.com/#sle.
3. Wheatland Tube, a Division of Zekelman Industries: www.wheatland.com/#sle.

B. Description: NFPA 70, Type RMC aluminum rigid metal conduit complying with ANSI C80.5 and listed and labeled as complying with UL 6A.

C. Fittings:
1. Manufacturers:
a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.
b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
c. Thomas & Betts Corporation: www.tnb.com/#sle.
2. Material: Use aluminum.
3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.04 INTERMEDIATE METAL CONDUIT (IMC)

A. Manufacturers:
1. Allied Tube & Conduit: www.alliedeg.com/#sle.
2. Republic Conduit: www.republic-conduit.com/#sle.
3. Wheatland Tube, a Division of Zekelman Industries: www.wheatland.com/#sle.

B. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.

C. Fittings:
1. Manufacturers:
a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.
b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
c. Thomas & Betts Corporation: www.tnb.com/#sle.
2. Material: Use steel or malleable iron.
3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.05 FLEXIBLE METAL CONDUIT (FMC)

A. Manufacturers:
1. AFC Cable Systems, Inc: www.afcweb.com/#sle.
2. Electri-Flex Company: www.electriflex.com/#sle.
3. International Metal Hose: www.metalhose.com/#sle.

B. Fittings:
1. Manufacturers:
a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.
b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
c. Thomas & Betts Corporation: www.tnb.com/#sle.
2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Material: Use steel or malleable iron.

2.06 ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:
1. Allied Tube & Conduit: www.alliedeg.com/#sle.
2. Republic Conduit: www.republic-conduit.com/#sle.
3. Wheatland Tube, a Division of Zekelman Industries: www.wheatland.com/#sle.

B. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

C. Fittings:

1. Manufacturers:
   a. Bridgeport Fittings Inc: www.bptfittings.com/#sle.
   b. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
   c. Thomas & Betts Corporation: www.tnb.com/#sle.
2. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
3. Material: Use steel or malleable iron.
4. Connectors and Couplings: Use compression (gland) type.
   a. Do not use set-screw type connectors and couplings.
5. Damp or Wet Locations (where permitted): Use fittings listed for use in wet locations.
6. Embedded Within Concrete (where permitted): Use fittings listed as concrete-tight. Fittings that require taping to be concrete-tight are acceptable.

2.07 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. Manufacturers:
   1. Cantex Inc: www.cantexinc.com/#sle.
   2. Carlon, a brand of Thomas & Betts Corporation: www.carlon.com/#sle.
   3. JM Eagle: www.jmeagle.com/#sle.

B. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

C. Fittings:
   1. Manufacturer: Same as manufacturer of conduit to be connected.
   2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.08 ACCESSORIES

A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil (0.51 mm).

B. Conduit Joint Compound: Corrosion-resistant, electrically conductive; suitable for use with the conduit to be installed.

C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

D. Pull Strings: Use nylon cord with average breaking strength of not less than 200 pound-force (890 N).

E. Sealing Compound for Sealing Fittings: Listed for use with the particular fittings to be installed.

F. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for conduits and roofing system to be installed; designed to accommodate existing penetrations where applicable.
   1. Products:
      a. Menzies Metal Products; Electrical Roof Stack and Cap: www.menzies-metal.com/#sle.
      b. Menzies Metal Products; Electrical Retro Box: www.menzies-metal.com/#sle.

G. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.
   1. Manufacturers:
      a. Quickflash Weatherproofing Products, Inc: www.quickflashproducts.com/#sle.

H. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

1. Products:
    a. HoldRite, a brand of Reliance Worldwide Corporation; HydroFlame Pro Series/HydroFlame Custom Built: www.holdrite.com/#sle.

I. Duct Bank Spacers: Nonmetallic; designed for maintaining conduit/duct spacing for concrete encasement in open trench installation; suitable for the conduit/duct arrangement to be installed.
1. Products:
    a. Advance Products & Systems, LLC; Duct Bank Spacers: www.apsonline.com/#sle.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive conduits.

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

3.02 INSTALLATION

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

B. Perform work in accordance with NECA 1 (general workmanship).

C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.

D. Install aluminum rigid metal conduit (RMC) in accordance with NECA 102.

E. Install intermediate metal conduit (IMC) in accordance with NECA 101.

F. Install PVC-coated galvanized steel rigid metal conduit (RMC) using only tools approved by the manufacturer.

G. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.

H. Conduit Routing:
1. Unless dimensioned, conduit routing indicated is diagrammatic.
2. When conduit destination is indicated without specific routing, determine exact routing required.
3. Conduits in the following areas may be exposed, unless otherwise indicated:
    a. Electrical rooms.
    b. Mechanical equipment rooms.
    c. Within joists in areas with no ceiling.
4. Conduits installed underground or embedded in concrete may be routed in the shortest possible manner unless otherwise indicated. Route all other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
5. Arrange conduit to maintain adequate headroom, clearances, and access.
6. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
7. Arrange conduit to provide no more than 150 feet (46 m) between pull points.
8. Route conduits above water and drain piping where possible.
9. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
10. Maintain minimum clearance of 6 inches (150 mm) between conduits and piping for other systems.
11. Maintain minimum clearance of 12 inches (300 mm) between conduits and hot surfaces. This includes, but is not limited to:
    a. Heaters.
    b. Hot water piping.
    c. Flues.

I. Conduit Support:
   1. Secure and support conduits in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.
   2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
   3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
   4. Use conduit strap to support single surface-mounted conduit.
   5. Use metal channel (strut) with accessory conduit clamps to support multiple parallel surface-mounted conduits.
   6. Use conduit clamp to support single conduit from beam clamp or threaded rod.
   7. Use trapeze hangers assembled from threaded rods and metal channel (strut) with accessory conduit clamps to support multiple parallel suspended conduits.
   8. Use non-penetrating rooftop supports to support conduits routed across rooftops (only where approved).
   9. Use of spring steel conduit clips for support of conduits is not permitted.
   10. Use of wire for support of conduits is not permitted.

J. Connections and Terminations:
   1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
   2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
   3. Use suitable adapters where required to transition from one type of conduit to another.
   4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
   5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
   6. Where spare conduits stub up through concrete floors and are not terminated in a box or enclosure, provide threaded couplings equipped with threaded plugs set flush with finished floor.
   7. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
   8. Secure joints and connections to provide maximum mechanical strength and electrical continuity.

K. Penetrations:
   1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
   2. Make penetrations perpendicular to surfaces unless otherwise indicated.
   3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
   4. Conceal bends for conduit risers emerging above ground.
   5. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.

L. Underground Installation:
   1. Minimum Cover, Unless Otherwise Indicated or Required:
      a. Underground, Exterior: 36 inches (915 mm).
      b. Under Slab on Grade: 18 inches (458 mm) to bottom of slab.
   2. Provide underground warning tape in accordance with Section 260553 along entire conduit length for service entrance where not concrete-encased.

M. Embedment Within Structural Concrete Slabs (only where approved by Structural Engineer):

N. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
   1. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.

O. Provide pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches (300 mm) at each end.

P. Provide grounding and bonding in accordance with Section 260526.

Q. Identify conduits in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C. Where coating of PVC-coated galvanized steel rigid metal conduit (RMC) contains cuts or abrasions, repair in accordance with manufacturer's instructions.

D. Correct deficiencies and replace damaged or defective conduits.

3.04 CLEANING

A. Clean interior of conduits to remove moisture and foreign matter.

3.05 PROTECTION

A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Outlet and device boxes up to 100 cubic inches (1,650 cu cm), including those used as junction and pull boxes.

B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches (1,650 cu cm).

C. Boxes and enclosures for integrated power, data, and audio/video.

D. Boxes for hazardous (classified) locations.

E. Underground boxes/enclosures.

F. Accessories.

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

B. Section 083100 - Access Doors and Panels: Panels for maintaining access to concealed boxes.

C. Section 260526 - Grounding and Bonding for Electrical Systems.

D. Section 260529 - Hangers and Supports for Electrical Systems.

E. Section 260533.13 - Conduit for Electrical Systems:
   1. Conduit bodies and other fittings.
   2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.

F. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

G. Section 262726 - Wiring Devices:
   1. Wall plates.
   2. Additional requirements for locating boxes for wiring devices.

H. Section 262813 - Fuses: Spare fuse cabinets.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013.

E. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. SCTE 77 - Specification for Underground Enclosure Integrity; 2017.

H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

J. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
6. Coordinate the work with other trades to preserve insulation integrity.
7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
8. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for cabinets and enclosures, boxes for hazardous (classified) locations, floor boxes, and underground boxes/enclosures.
   1. Underground Boxes/Enclosures: Include reports for load testing in accordance with SCTE 77 certified by a professional engineer or an independent testing agency upon request.

C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Keys for Lockable Enclosures: Two of each different key.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 BOXES

A. General Requirements:
   1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
   2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
   3. Provide products listed, classified, and labeled as suitable for the purpose intended.
   4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches (1,650 cu cm), Including Those Used as Junction and Pull Boxes:
   1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
   2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
   3. Use cast iron boxes or cast aluminum boxes where exposed galvanized steel rigid metal conduit or exposed intermediate metal conduit (IMC) is used.
   4. Use cast aluminum boxes where aluminum rigid metal conduit is used.
   5. Use suitable concrete type boxes where flush-mounted in concrete.
   6. Use suitable masonry type boxes where flush-mounted in masonry walls.
   7. Use raised covers suitable for the type of wall construction and device configuration where required.
   8. Use shallow boxes where required by the type of wall construction.
   9. Do not use "through-wall" boxes designed for access from both sides of wall.
   10. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
   11. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
   12. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
   13. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
   14. Minimum Box Size, Unless Otherwise Indicated:
       a. Wiring Devices (Other Than Communications Systems Outlets): 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size.
       b. Ceiling Outlets: 4 inch octagonal or square by 1-1/2 inch deep (100 by 38 mm) trade size.
   15. Wall Plates: Comply with Section 262726.
   16. Manufacturers:
       a. Cooper Crouse-Hinds, a division of Eaton Corporation : www.cooperindustries.com/#sle.
       b. Hubbell Incorporated; Bell Products: www.hubbell-rtb.com/#sle.
       c. Hubbell Incorporated; RACO Products: www.hubbell-rtb.com/#sle.
       d. O-Z/Gedney, a brand of Emerson Electric Co: www.emerson.com/#sle.
       e. Thomas & Betts Corporation: www.tnb.com/#sle.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
   1. Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
   2. NEMA EN 10250 Environment Type, Unless Otherwise Indicated:
       a. Indoor Clean, Dry Locations: Type 1, painted steel.
       b. Outdoor Locations: Type 3R, painted steel.
   3. Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
       a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
       b. Boxes 6 square feet (0.56 sq m) and Larger: Provide sectionalized screw-cover or hinged-cover enclosures.
   4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
       a. Provide lockable hinged covers, all locks keyed alike unless otherwise indicated.
       b. Back Panels: Painted steel, removable.

c. Terminal Blocks: Provide voltage/current ratings and terminal quantity suitable for purpose indicated, with 25 percent spare terminal capacity.

5. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.
6. Manufacturers:
   a. Cooper B-Line, a division of Eaton Corporation: www.cooperindustries.com/#sle.
   b. Hoffman, a brand of Pentair Technical Products: www.hoffmanonline.com/#sle.
   c. Hubbell Incorporated; Wiegmann Products: www.hubbell-wiegmann.com/#sle.

D. Underground Boxes/Enclosures:
1. Description: In-ground, open bottom boxes furnished with flush, non-skid covers with legend indicating type of service and stainless steel tamper resistant cover bolts.
2. Size: As required _____.
3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 12 inches (300 mm).
4. Applications:
   a. Sidewalks and Landscaped Areas Subject Only to Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77 Tier 8 load rating.
   b. Parking Lots, in Areas Subject Only To Occasional Nondeliberate Vehicular Traffic: Use polymer concrete enclosures, with minimum SCTE 77 Tier 15 load rating.
   c. Do not use polymer concrete enclosures in areas subject to deliberate vehicular traffic.
5. Polymer Concrete Underground Boxes/Enclosures: Comply with SCTE 77.
   a. Manufacturers:
      1) Hubbell Incorporated; Quazite Products: www.hubbellpowersystems.com/#sle.
      2) MacLean Highline: www.macleanhighline.com/#sle.
      3) Oldcastle Precast, Inc: www.oldcastleprecast.com/#sle.
   b. Combination fiberglass/polymer concrete boxes/enclosures are acceptable.

2.02 ACCESSORIES

A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for boxes and facade materials to be installed.
1. Manufacturers:
   a. Quickflash Weatherproofing Products, Inc: www.quickflashproducts.com/#sle.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive boxes.

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

3.02 INSTALLATION

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

B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide separate boxes for emergency power and normal power systems.

E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.

F. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.

G. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.

H. Box Locations:
   1. Locate boxes to be accessible. Provide access panels in accordance with Section 083100 as required where approved by the Architect.
   2. Unless dimensioned, box locations indicated are approximate.
   3. Locate boxes as required for devices installed under other sections or by others.
      a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 262726.
   4. Locate boxes so that wall plates do not span different building finishes.
   5. Locate boxes so that wall plates do not cross masonry joints.
   6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
   7. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches (150 mm) horizontal separation unless otherwise indicated.
   8. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches (610 mm) horizontal separation.
   9. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
      a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches (610 mm) separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.
      b. Do not install flush-mounted boxes with area larger than 16 square inches (0.0103 sq m) or such that the total aggregate area of openings exceeds 100 square inches (0.0645 sq m) for any 100 square feet (9.29 sq m) of wall area.
   10. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 260533.13.
   11. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:
      a. Concealed above accessible suspended ceilings.
      b. Within joists in areas with no ceiling.

I. Box Supports:
   1. Secure and support boxes in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.
   2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.

J. Install boxes plumb and level.

K. Flush-Mounted Boxes:
   1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch (6 mm) or does not project beyond finished surface.
   2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
   3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch (3 mm) at the edge of the box.

L. Install boxes as required to preserve insulation integrity.

M. Underground Boxes/Enclosures:

1. Install enclosure on gravel base, minimum 6 inches (150 mm) deep.
2. Install additional bracing inside enclosures in accordance with manufacturer's instructions to minimize box sidewall deflections during backfilling. Backfill with cover bolted in place.

N. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

O. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

P. Close unused box openings.

Q. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

R. Provide grounding and bonding in accordance with Section 260526.

S. Identify boxes in accordance with Section 260553.

3.03 CLEANING

A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

3.04 PROTECTION

A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical identification requirements.

B. Identification nameplates and labels.

C. Wire and cable markers.

D. Voltage markers.

E. Underground warning tape.

F. Floor marking tape.

G. Warning signs and labels.

1.02 RELATED REQUIREMENTS

A. Section 099113 - Exterior Painting.

B. Section 099123 - Interior Painting.

C. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.

D. Section 260536 - Cable Trays for Electrical Systems: Additional identification requirements for cable tray systems.

E. Section 260573 - Power System Studies: Arc flash hazard warning labels.

F. Section 262300 - Low-Voltage Switchgear: Factory-installed mimic bus.

G. Section 262726 - Wiring Devices - Lutron: Device and wallplate finishes; factory pre-marked wallplates.

H. Section 271000 - Structured Cabling: Identification for communications cabling and devices.

1.03 REFERENCE STANDARDS

A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs; 2023.

B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2023.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. NFPA 70E - Standard for Electrical Safety in the Workplace; 2024.

E. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.

B. Sequencing:

1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
2. Do not install identification products until final surface finishes and painting are complete.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.06 FIELD CONDITIONS

A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

A. Existing Work: Unless specifically excluded, identify existing elements to remain that are not already identified in accordance with specified requirements.

B. Identification for Equipment:
   1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
      a. Switchboards:
         1) Identify ampere rating.
         2) Identify voltage and phase.
         3) Identify power source and circuit number. Include location when not within sight of equipment.
         4) Use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
      b. Panelboards:
         1) Identify ampere rating.
         2) Identify voltage and phase.
         3) Identify power source and circuit number. Include location when not within sight of equipment.
         4) Identify main overcurrent protective device. Use identification label for panelboards with a door. For power distribution panelboards without a door, use identification nameplate.
         5) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces.
         6) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
      c. Transformers:
         1) Identify kVA rating.
         2) Identify voltage and phase for primary and secondary.
         3) Identify power source and circuit number. Include location when not within sight of equipment.
         4) Identify load(s) served. Include location when not within sight of equipment.
      d. Enclosed switches, circuit breakers, and motor controllers:
         1) Identify voltage and phase.
         2) Identify power source and circuit number. Include location when not within sight of equipment.
         3) Identify load(s) served. Include location when not within sight of equipment.
      e. Time Switches:
         1) Identify load(s) served and associated circuits controlled. Include location.
      f. Electricity Meters:
         1) Identify load(s) metered.
   2. Service Equipment:
      a. Use identification nameplate to identify each service disconnecting means.
      b. For buildings or structures supplied by more than one service, or any combination of branch circuits, feeders, and services, use identification nameplate or means of identification acceptable to authority having jurisdiction at each service disconnecting means to identify all other services, feeders, and branch circuits supplying that building or structure. Verify format and descriptions with authority having jurisdiction.
   3. Emergency System Equipment:
      a. Use identification nameplate or voltage marker to identify emergency system equipment in accordance with NFPA 70.

b. Use identification nameplate at each piece of service equipment to identify type and location of on-site emergency power sources.
c. Use identification nameplate to identify emergency operating instructions for emergency system equipment.

4. Use voltage marker to identify highest voltage present for each piece of electrical equipment.
5. Use identification nameplate to identify equipment utilizing series ratings, where permitted, in accordance with NFPA 70.
6. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.
7. Use identification label or handwritten text using indelible marker on inside of door at each fused switch to identify required NEMA fuse class and size.
8. Use identification label or handwritten text using indelible marker on inside of door at each motor controller to identify nameplate horsepower, full load amperes, code letter, service factor, voltage, and phase of motor(s) controlled.
9. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".
10. Use field-painted floor markings, floor marking tape, or warning labels to identify required equipment working clearances where indicated or where required by the authority having jurisdiction.
    a. Field-Painted Floor Markings: Alternating black and white stripes, 3 inches (76 mm) wide, painted in accordance with Section 099123 and 099113.
11. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.
    a. Service equipment.
    b. Industrial control panels.
    c. Motor control centers.
    d. Elevator control panels.
    e. Industrial machinery.
12. Arc Flash Hazard Warning Labels: Comply with Section 260573.
13. Use warning signs to identify electrical hazards for entrances to all rooms and other guarded locations that contain exposed live parts operating at 600 V nominal or less with the word message "DANGER; Electrical hazard; Authorized personnel only" or approved equivalent.
14. Use warning signs to identify electrical hazards for entrances to all buildings, vaults, rooms, or enclosures containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".
15. Use warning labels to identify electrical hazards for equipment, compartments, and enclosures containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".
16. Use warning labels, identification nameplates, or identification labels to identify electrical hazards for equipment where multiple power sources are present with the word message "DANGER; Hazardous voltage; Multiple power sources may be present; Disconnect all electric power including remote disconnects before servicing" or approved equivalent.

C. Identification for Conductors and Cables:
1. Color Coding for Power Conductors 600 V and Less: Comply with Section 260519.
2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
3. Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
    a. At each source and load connection.

b. Within boxes when more than one circuit is present.
c. Within equipment enclosures when conductors and cables enter or leave the enclosure.

4. Use wire and cable markers to identify connected grounding electrode system components for grounding electrode conductors.
5. Use underground warning tape to identify direct buried cables.

D. Identification for Raceways:
1. Use voltage markers to identify highest voltage present for accessible conduits at maximum intervals of 20 feet (6.1 m).
2. Use voltage markers, color-coded bands, or factory-painted conduits to identify systems other than normal power system for accessible conduits.
a. Maximum Intervals: 20 feet (6.1 m).
b. Color-Coded Bands: Use field-painting or vinyl color coding electrical tape to mark bands 3 inches (76 mm) wide.
1) Field-Painting: Comply with Section 099123 and 099113.
2) Vinyl Color Coding Electrical Tape: Comply with Section 260519.
3. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify circuits enclosed for accessible conduits at wall penetrations, at floor penetrations, at roof penetrations, and at equipment terminations when source is not within sight.
4. Use identification labels, handwritten text using indelible marker, or plastic marker tags to identify spare conduits at each end. Identify purpose and termination location.
5. Use underground warning tape to identify underground raceways.
6. Use voltage markers to identify highest voltage present for wireways at maximum intervals of 20 feet (6.1 m).

E. Identification for Boxes:
1. Use voltage markers to identify highest voltage present.
2. Use voltage markers or color coded boxes to identify systems other than normal power system.
a. Color-Coded Boxes: Field-painted in accordance with Section 099123 and 099113 per the same color code used for raceways.
1) Fire Alarm System: Red.
3. Use identification labels or handwritten text using indelible marker to identify circuits enclosed.
4. Use warning labels to identify electrical hazards for boxes containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".

F. Identification for Devices:
1. Identification for Communications Devices: Comply with Section 271000.
2. Wiring Device and Wallplate Finishes: Comply with Section 262726.
3. Factory Pre-Marked Wallplates: Comply with Section 262726.
4. Use identification label to identify fire alarm system devices.
a. For devices concealed above suspended ceilings, provide additional identification on ceiling tile below device location.
5. Use identification label or engraved wallplate to identify serving branch circuit for all receptacles.
a. For receptacles in public areas or in areas as directed by Architect, provide identification on inside surface of wallplate.
6. Use identification label or engraved wallplate to identify load controlled for wall-mounted control devices controlling loads that are not visible from the control location and for multiple wall-mounted control devices installed at one location.
7. Use identification label to identify receptacles protected by upstream GFI protection, where permitted.

G. Identification for Luminaires:
   1. Use permanent red dot on luminaire frame to identify luminaires connected to emergency power system.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:
   1. Manufacturers:
      a. Brimar Industries, Inc: www.brimar.com/#sle.
      b. Seton Identification Products: www.seton.com/#sle.
   2. Materials:
      a. Indoor Clean, Dry Locations: Use plastic nameplates.
   3. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch (1.6 mm); engraved text.
      a. Exception: Provide minimum thickness of 1/8 inch (3 mm) when any dimension is greater than 4 inches (100 mm).
   4. Stainless Steel Nameplates: Minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
   5. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
   6. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch (25 mm) high; Four, located at corners for larger sizes.

B. Identification Labels:
   1. Manufacturers:
      a. Brady Corporation; <>: www.bradyid.com/#sle.
      b. Brother International Corporation: www.brother-usa.com/#sle.
      c. Panduit Corp: www.panduit.com/#sle.
   2. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
   3. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

C. Format for Equipment Identification:
   1. Minimum Size: 1 inch (25 mm) by 2.5 inches (64 mm).
   2. Legend:
      a. Equipment designation or other approved description.
   3. Text: All capitalized unless otherwise indicated.
   4. Minimum Text Height:
      a. System Designation: 1 inch (25 mm).
      b. Equipment Designation: 1/2 inch (13 mm).
      c. Other Information: 1/4 inch (6 mm).
      d. Exception: Provide minimum text height of 1 inch (25 mm) for equipment located more than 10 feet (3.0 m) above floor or working platform.
   5. Color:
      a. Normal Power System: White text on black background.
      b. Emergency Power System: White text on red background.
      c. Fire Alarm System: White text on red background.

D. Format for General Information and Operating Instructions:
   1. Minimum Size: 1 inch (25 mm) by 2.5 inches (64 mm).
   2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
   3. Text: All capitalized unless otherwise indicated.
   4. Minimum Text Height: 1/4 inch (6 mm).

5. Color: Black text on white background unless otherwise indicated.

E. Format for Caution and Warning Messages:
1. Minimum Size: 2 inches (51 mm) by 4 inches (100 mm).
2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 1/2 inch (13 mm).
5. Color: Black text on yellow background unless otherwise indicated.

F. Format for Receptacle Identification:
1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).
2. Legend: Power source and circuit number or other designation indicated.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch (5 mm).
5. Color: Black text on clear background.

G. Format for Fire Alarm Device Identification:
1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).
2. Legend: Designation indicated and device zone or address.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch (5 mm).
5. Color: Red text on white background.

2.03 WIRE AND CABLE MARKERS

A. Manufacturers:
1. Brady Corporation: www.bradyid.com/#sle.
2. HellermannTyton: www.hellermanntyton.com/#sle.

B. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.
1. Do not use self-adhesive type markers.

C. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.

D. Legend: Power source and circuit number or other designation indicated.

E. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
1. Do not use handwritten text.

F. Minimum Text Height: 1/8 inch (3 mm).

G. Color: Black text on white background unless otherwise indicated.

2.04 VOLTAGE MARKERS

A. Manufacturers:
1. Brady Corporation: www.bradyid.com/#sle.
2. Brimar Industries, Inc: www.brimar.com/#sle.
3. Seton Identification Products: www.seton.com/#sle.

B. Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth, or vinyl snap-around type markers.

C. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.

D. Minimum Size:
1. Markers for Equipment: 1 1/8 by 4 1/2 inches (29 by 110 mm).
2. Markers for Conduits: As recommended by manufacturer for conduit size to be identified.
3. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches (29 by 110 mm).

4. Markers for Junction Boxes: 1/2 by 2 1/4 inches (13 by 57 mm).

E. Legend:
1. Markers for Voltage Identification: Highest voltage present.
2. Markers for System Identification:
a. Emergency Power System: Text "EMERGENCY".

F. Color: Black text on orange background unless otherwise indicated.

2.05 UNDERGROUND WARNING TAPE

A. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.

B. Non-detectable Type Tape: 6 inches (152 mm) wide, with minimum thickness of 4 mil (0.1 mm).

C. Legend: Type of service, continuously repeated over full length of tape.

D. Color:

2.06 FLOOR MARKING TAPE

A. Manufacturers:
1. Brady Corporation: www.bradyid.com/#sle.
2. Brimar Industries, Inc: www.brimar.com/#sle.
3. Seton Identification Products: www.seton.com/#sle.

B. Floor Marking Tape for Equipment Working Clearance Identification: Self-adhesive vinyl or polyester tape with overlaminate, 3 inches (76 mm) wide, with alternating black and white stripes.

2.07 WARNING SIGNS AND LABELS

A. Manufacturers:
1. Brimar Industries, Inc: www.brimar.com/#sle.
2. Clarion Safety Systems, LLC: www.clarionsafety.com/#sle.
3. Seton Identification Products: www.seton.com/#sle.

B. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

C. Warning Signs:
1. Materials:
a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
b. Outdoor Locations: Use factory pre-printed rigid aluminum signs.
2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.
3. Minimum Size: 7 by 10 inches (178 by 254 mm) unless otherwise indicated.

D. Warning Labels:
1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
a. Do not use labels designed to be completed using handwritten text.
2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
3. Minimum Size: 2 by 4 inches (51 mm by 102 mm) unless otherwise indicated.

PART 3 EXECUTION

3.01 PREPARATION

A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.02 INSTALLATION

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

B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
   1. Surface-Mounted Equipment: Enclosure front.
   2. Flush-Mounted Equipment: Enclosure front.
   3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
   4. Elevated Equipment: Legible from the floor or working platform.
   5. Branch Devices: Adjacent to device.
   6. Interior Components: Legible from the point of access.
   7. Conduits: Legible from the floor.
   8. Boxes: Outside face of cover.
   9. Conductors and Cables: Legible from the point of access.
   10. Devices: Outside face of cover.

C. Install identification products centered, level, and parallel with lines of item being identified.

D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.

E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.

F. Install underground warning tape above buried lines with one tape per trench at 3 inches (75 mm) below finished grade.

G. Secure rigid signs using stainless steel screws.

H. Mark all handwritten text, where permitted, to be neat and legible.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical connections to equipment.

1.02 RELATED REQUIREMENTS

A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables.

B. Section 260533.13 - Conduit for Electrical Systems.

C. Section 260533.16 - Boxes for Electrical Systems.

D. Section 262726 - Wiring Devices.

E. Section 262816.16 - Enclosed Switches.

1.03 REFERENCE STANDARDS

A. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).

B. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2021.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
   2. Determine connection locations and requirements.

B. Sequencing:
   1. Install rough-in of electrical connections before installation of equipment is required.
   2. Make electrical connections before required start-up of equipment.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.01 MATERIALS

A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
   1. Colors: Comply with NEMA WD 1.
   2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
   3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

B. Disconnect Switches: As specified in Section 262816.16 and in individual equipment sections.

C. Wiring Devices: As specified in Section 262726.

D. Flexible Conduit: As specified in Section 260533.13.

E. Wire and Cable: As specified in Section 260519.

F. Boxes: As specified in Section 260533.16.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.02 ELECTRICAL CONNECTIONS

A. Make electrical connections in accordance with equipment manufacturer's instructions.

B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.

C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.

D. Provide receptacle outlet to accommodate connection with attachment plug.

E. Provide cord and cap where field-supplied attachment plug is required.

F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.

H. Install terminal block jumpers to complete equipment wiring requirements.

I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE

A. This specification Section applies to the following spaces:

1. Vestibule
2. Stair
3. Foyer
4. Rotunda
5. Friend’s Reading Room
6. Reference Room
7. Reference Annex

Although this system may feed or control fixtures outside of the areas listed above, specification and review for all such areas shall be by the Architect and Electrical Engineer.

B. All materials, components, and services necessary to provide a complete system indicated in this Section, as specified herein and shown on related Drawings, including:

1. Verification of dimensions and conditions at the job site to ensure proper fitting of the work.
2. Preparation and submission of complete control system shop drawings and samples for review prior to fabrication.
3. Shipment of equipment to the job site.
4. Installation and completion in accordance with these Specifications, related Drawings, the Equipment Manufacturer's recommendations, established trade criteria, and all applicable code requirements.
5. The inspection, demonstration, and necessary adjustment of the completed installation by the Manufacturer's engineering personnel.
6. Preparation and submission of complete record drawings and operational and maintenance data and certificates.
7. Warranty coverage as required herein.

1.2 WORK INCLUDED

A. Interfaces and accessories

B. Specialty lighting controls

C. Dimmers and dimming panels

D. Lighting contactor panels

E. Emergency dimming panels

The above is for reference only and is not intended to define the limits of the work for a complete installation.

1.3 RELATED WORK IN OTHER SECTIONS

A. General requirements for all electrical work

B. Electrical service

C. Wiring devices for electrical distribution

D. Lighting Control Systems for spaces not listed in Section 1.1.A above.

E. Lighting Fixtures

F. Audio Visual Systems

G. Building Automation Systems

H. Fire Alarm Systems

I. Information Technology Systems

1.4 QUALIFICATIONS

A. Dimming and control system equipment shall be provided by qualified Lighting Control Manufacturers.

B. Manufacturers shall have at least ten (10) years of experience in the fabrication of similar equipment.

C. If requested, Manufacturers shall submit a representative list of installations similar in scope to this project during the above period.

D. Subject to the above requirements, the equipment indicated herein shall be by one of the following manufacturers:

1. Lutron Electronics, Coopersburg, Pennsylvania

E. Manufacturers that are not listed as the Basis of Design may be considered with the prior review of the Lighting Consultant. Manufacturers seeking review must contact the Lighting Consultant not later than ten (10) days prior to bid date.

F. The Manufacturer shall be responsible for the integration, operation, and performance of all elements of the system described in this Section. The Manufacturer shall provide all warranty work and equipment upgrades as called for in this Section. The Manufacturer and/or a factory-authorized representative shall be available for product service onsite within (24) hours of a call for service.

1.5 SUBMITTALS

A. Pre bid.

1. Substitutions.

a. Requests for substitutions shall be made no less than ten (10) business days prior to bid due date. No requests for substitutions shall be considered after this time.

b. Manufacturers that are not listed in Section 1.4 shall submit the following, in addition to the requirements of Section 1.5.C:

1) A statement proving that the Manufacturer meets all of the qualifications as set forth in Section 1.4 above, including a list of representative installations similar in scope to this project. Include the Owner contact names and phone numbers as references.

2) A proposal fully explaining how the system will meet the requirements of this Specification. The proposal shall include, but not be limited to panel schedules, one line diagrams, and cutsheets and full specifications for all of the system components.

3) A full listing of all fixture types, including catalog numbers, with proposed changes to the dimming drivers and ballasts for compatibility with the control system.

4) Product samples and/or mock-ups as requested by the Lighting Consultant.

c. Specified products are known to be available at the time of construction. Should the Contractor discover that any equipment may be unavailable, it is the Contractor's responsibility to notify the Architect not less than ten (10) business days prior to bid.

d. Owner Directed Changes. If the Owner directs the Contractor to submit an alternate control system for the purpose of reducing the costs, substitutions shall meet or exceed the quality and capabilities of the specified system. Such requests for substitutions shall be submitted in accordance with the requirements of section 1.5.C.

e. If a proposed substitute fails to comply with the Specification requirements, the Contractor shall furnish the acceptable control system at no additional cost to the Owner, and with no delay to the project.

B. With bid.

1. All deviations and exceptions from this Specification must be revealed with bid. Deviations and exceptions from the Specification submitted after this time shall not be accepted, whether or not these variations have been formally or informally accepted by the Architect or Lighting Consultant.

2. Manufacturers' catalog numbers listed in the drawings are included to aid in control system/component identification. These numbers are subject to periodic change by manufacturers and therefore need to be used in conjunction with the system descriptions. Incomplete or obsolete catalog numbers do not indemnify the Contractor from providing equipment as described in the drawings and in this Specification.

3. Manufacturer shall indicate any additional wire or conduit runs that are not shown in the Drawings that will be required to install Manufacturer's system.

4. Control System Lead Times. Many control systems require substantial lead times for delivery. It is the Contractor's responsibility to verify lead times and to notify the Architect within 2 weeks of contract award if any lead time will not allow them to meet the schedule for project completion.

C. Shop drawings. The Contractor shall submit shop drawings to the Architect, Lighting Consultant, and Electrical Engineer for review prior to fabrication. The contents of the shop drawings shall be prepared by the Manufacturers and/or the Manufacturers' Representatives. Shop drawings prepared solely by a Distributor or Contractor will not be acceptable. If the Lighting Consultant is required to review submittals prepared by a Distributor / Contractor, and

is then required to re-review submittals for the same equipment prepared by a Manufacturer / Manufacturers Representative, the Contractor shall reimburse the Lighting Consultant, at their current hourly rates, for the duplicate time and expenses incurred. Shop drawings shall contain, at a minimum, the following information:

1. Dimensions, components, and finishes of all equipment and accessories.
2. All system assemblies and major sub-assemblies, cabinets, and enclosures, including notation of type and Manufacturer of switches, pilot lights, locks, hardware, and electrical and electronic connectors.
3. Block schematics of system internal wiring and system element interconnection.
4. Panel schedules showing circuit descriptions, control channel descriptions, load types, etc.
5. Control station cutsheets showing station sizes, mounting details, button configurations, preset labels, engraving information, etc.
6. Comprehensive system one-line diagram.
7. Indication of lead time for delivery.
8. Quantities of each component and sub-assembly.
9. Indication by boxed caption of any and all variations from contract Drawings and Specifications, whether or not these variations have been formally or informally accepted by the Architect or Lighting Consultant.
10. Standard catalog cut sheets with insufficient information will not be accepted.
11. Submittals must be prepared by the Manufacturer and/or their local Representative. Submittals prepared by the Distributor or Contractor without the assistance of the Manufacturer and/or their local Representative will not be reviewed or accepted.

D. Samples. Within sixty (60) days of receipt of order, submit to the Architect for review prior to fabrication:

1. Samples of faceplates and faceplate engravings.
2. Samples of any equipment component requested by the Lighting Consultant.

Samples shall not be included in quantities of equipment specified but shall be returned.

E. Pending Items. The Contractor shall submit a schedule of lead times for pending items such as faceplate engravings.

F. Final submittal. Within thirty (30) days of final tests, and as a condition for final review, shall submit to the Architect:

1. Receipts for delivery of all non-installed items, i.e., all items designated, "deliver to Owner."
2. Five (5) bound sets to the Architect, and one (1) bound set to the Lighting Consultant:
   a. "As built and approved" drawings showing all systems and components as installed, including all field modifications.
   b. Operating and maintenance manuals.
   c. Parts lists.
   d. Certificates of warranty, as set forth below.

1.6 GENERAL REQUIREMENTS

A. General Conditions of the project contract, work schedules, and site regulations apply to this work.

B. This work shall comply with local codes and applicable NEC and UL standards. All components shall carry pertinent labels of a Nationally Recognized Testing Laboratory (NRTL), such as UL or ETL.

C. The Contractor shall provide full insurance against loss or damage during shipment, storage, installation, and testing. Certification of such coverage shall be furnished to the Architect within thirty (30) days of award of contract.

D. Warranty.

1. Unconditionally warrant all equipment and systems provided under this Section to be free from defects in materials and workmanship for a period of at least twelve (12) months from the date of final acceptance of all work of this Section. Replacement of faulty materials and the cost of labor required for the replacement shall be the responsibility of the Contractor.

2. Appropriate additional equipment to replace equipment removed for service shall be provided at the job site at no expense to the Owner to replace any and all equipment that must be removed for service. Replacement equipment must be the same model that was removed for service.

3. Warranty service shall be performed by personnel in the employ of the Manufacturer and shall not be sub-contracted or assigned to another company, service, or individual unless the Owner has approved such assignment in writing, in which event the Manufacturer shall nevertheless be responsible to the Owner for such work.

E. For a period of two (2) years following acceptance, the Manufacturer shall provide and install, at no cost to the Owner, all operating system upgrades. Thereafter, the Manufacturer shall notify the Owner of all operating system upgrades for the life of the control system. The Manufacturer shall keep the system user's name and address in a database for this purpose. All upgrades shall include a full written description of operational modifications. System upgrades shall be designed so as to allow existing data to be accessed and upgraded.

F. For a period of five (5) years following acceptance, the Manufacturer shall maintain service capability by guaranteeing a factory-authorized representative available for on-site service calls within twenty-four (24) hours of notification by Owner of a need for service.

G. State-of-the-art Assurance.

1. All products specified shall be the Manufacturer’s most recent iteration and most recent product. No products shall be accepted if they have been discontinued or superseded at the time of shipment. Should the Manufacturer develop products of comparable function above and beyond the specification of the listed product, the Contractor shall notify the Architect and the Lighting Consultant of any developments to the specified products and shall note any change in the requirements of building infrastructure(s) to support the developments. The Architect and Lighting Consultant shall then determine whether upgraded products shall be accepted.

PART 2 PRODUCTS

1.7 GENERAL

A. The entire Control System shall be the responsibility of a single Manufacturer unless otherwise approved in writing by the Lighting Consultant.

B. Provide, as part of the work of this Section, one computer, complete with programming software, for the purpose of programming the lighting system. The computer shall meet the Manufacturer's requirements and shall be available during the Factory Technician's system turn-on and programming sessions.

C. Materials shall be new and free from defects that in any manner may impair their character, appearance, strength, durability, and function. Materials shall be effectively protected from any damage from the time of fabrication until final acceptance of the work.

D. Verify equipment mounting conditions, clearances, and structural mounting supports prior to the procurement of equipment.

E. Notify the Architect immediately of any conflicts between the specified equipment and the actual mounting conditions.

F. Provide mounting hardware as required for a complete installation.

G. Provide equipment complete with accessories, interfaces, repeaters, boosters, amplifiers, etc. as required, as shown on the Drawings, and as required by this Specification.

H. The construction and operation of the power panels shall meet all applicable local and national codes.

I. Equipment shall carry labels of a Nationally-Recognized Testing Laboratory (NRTL), such as UL or ETL. Such labels shall be permanently attached in a conspicuous location that does not affect performance or aesthetics.

J. Components shall bear labels identifying the Manufacturer, model number, and serial number. Such labels shall be permanently attached in a conspicuous location that does not affect performance or aesthetics .

K. Refer to the one-line diagram and schedules in the Drawings for additional information.

1.8 SYSTEM OVERVIEW

A. The interior emergency and architectural lighting for areas listed in Section 1.1.A shall be fed and controlled by a single Control System. All other lighting fixtures shall be fed and controlled as shown in the Drawings and corresponding Specification section.

B. The Control System shall switch or dim the lighting fixtures in response to user input, daylight harvesting/photocell input, A/V interface input, etc. Areas with dimming shall have different presets, or "lighting looks", that are programmed in the field and can be easily recalled. The lighting controls shall interface with various systems, where required, including audio visual controls, motorized window shade controls, photocells, etc.

C. In areas with daylight harvesting controls, photocells shall monitor the available daylight and dim the associated lighting fixtures accordingly. Daylight harvesting controls shall override the light level settings in any given preset. Users shall be able to dim light levels further below the

daylight harvesting levels through pushing the "down" dimming button on control stations. Users shall not be able to raise light levels above the daylight harvesting levels.

D. The Control System shall have one control processor or server that can monitor, control, and program (live or off-line) all Areas, Control Channels, and Presets that are part of the system.

E. For everyday use, Wallstations shall initiate Presets. In some spaces, Presets can also be initiated by A/V controls that interface with the lighting controls.

F. The Control System shall have the following minimum capacities:

1. Digital Communication Busses to accommodate all digitally addressable drivers
2. 32 Control Channels per Area
3. 5 Presets per Area

Refer to the one-line diagram and control channel schedules in the Drawings for additional information. Contractor and Manufacturer shall verify actual capacities required for the system.

G. The Control System shall be able to:

1. Assign dimmers and digitally addressable drivers to specific Control Channels
2. Determine the number and names of Areas
3. Define the number and names of Control Channels and Presets per Area
4. Assign Control Channels to specific Areas
5. Define the functionality of all Control Stations
6. Customize the labeling of Areas, Control Channels, Presets, and Control Stations as directed by the Lighting Consultant
7. Set the astronomic timeclock based on project location and daylight savings time
8. Accommodate tunable white mixing
9. Accommodate hours of operation monitoring, recording, and notification to End User
10. Provide real-time and historical energy usage reports to End User
11. Provide system maintenance reports to End User
12. Accommodate automated load shedding
13. Accommodate Space Utilization reporting to End User

H. The Control System shall have interfaces that allow communication between the Control System, building automation system, audio visual system, photocells, motion sensors, computer laptop, etc., and the dimmers and contactors. Interfaces shall be capable of communicating using one or more of the following control protocols:

1. TCP/IP (Ethernet)
2. RS232
3. DMX512
4. Contact Closure

I. When more than one control device is connected to the Control System at the same time, dimmers and contactors shall respond on a last-action-takes-precedence basis.

J. Control Channels. A control channel is a circuit or group of circuits that are controlled together. A control channel may include circuits from multiple panels, and may include dim and/or non-dim circuits.

1. The Control System shall be capable of electronically assigning circuits to control channels. No one circuit shall be on more than one control channel.
2. Each Control Channel shall have its own, distinct name. Names shall be determined by the Lighting Consultant and are specified in the control channel schedule(s). Control Channels shall be pre-programmed into the Control System by the Manufacturer. Control Channels shall be modified as needed once the system is installed.
3. Dimmable Control Channels for LED, fluorescent, and neon sources shall have a field-customized high-end curve to ensure that these sources do not flicker between 0% and the low end of their range.
4. Dimmable Control Channels for halogen and incandescent sources shall have a field-customized high-end trim to ensure that these sources are never operating at a true 100%, in order to extend lamp life.

K. Presets. A preset is a specific lighting “look” created by programming various Control Channels to different intensities that can be simply recalled.

1. The Control System shall be capable of electronically “locking” presets once they are programmed in order to prevent unauthorized tampering with the system.
2. Presets shall be capable of being initiated by:
   a. Preset Control Stations
   b. Timeclocks
   c. Building Automation Systems
   d. Occupancy / vacancy sensors
   e. Photocells
   f. External Audio Visual equipment
   g. Other external devices via dry contacts
3. Presets shall be programmed into the Control System once the system is installed.
4. When a new preset is initiated, the Control System shall cross-fade from the previous preset to the new preset. The fade time shall be determined by the Lighting Consultant during the programming sessions.
5. The Manufacturer shall confirm the Preset names with the Lighting Consultant prior to programming the Control System.

L. Areas. An Area is a set of Control Channels that can be programmed independently of other Control Channels.

1. Areas shall have their own, distinct Presets.
2. Each room shall be programmed as a separate Area.
3. Areas shall be pre-programmed into the Control System by the Manufacturer. Areas shall be modified as needed once the system is installed.

M. The following Control Systems shall be acceptable. Do not substitute.

1. Basis of Design: Lutron “Athena”

1.9 PROGRAMMING COMPONENTS

A. Lighting Control Processor.

1. The Lighting Control Processor shall be pre-programmed by the Manufacturer to include all of the Areas, Control Channels, load types, etc. as specified in the control schedules in the Drawings. Specific lighting levels and fade times shall be programmed in the field. The Lighting Control Processor shall be programmed via a laptop computer with a "Windows" operating system. The laptop shall be linked to the Lighting Control Processor via a control receptacle and/or interface adaptor. The software used to program the Lighting Control Interface shall be supplied by the Manufacturer.
2. The programming software shall be capable of receiving programming data from all of the following sources:
    a. CD, USB memory stick, or SD memory card
    b. Modem
    c. Computer
    d. Handheld Programmer
3. Control stations shall provide power failure memory so that lights come back on to the same levels as prior to the power interruption.
4. Provide and install Lighting Control Processor as shown in the Drawings.

B. Programming Software.

1. The Control System software shall be able to:
    a. View the status of all Areas, Presets, Control Channels, and fade times.
    b. Print a summary of the Areas, Presets, Control Channels, and Control Stations.
2. Provide the Owner with one copy of all programming software and any necessary Manufacturer training in the use of the software. All costs for software and/or training shall be included as part of the work of this Section.

C. Control Receptacle Panel.

1. The face of the panel shall contain flush mounted receptacles. These receptacles shall be of the locking type and shall be sized for the proper number and capacity of conductors as indicated in the Drawings.
2. Receptacles shall be provided for a laptop hook-up, and shall be labeled, "LIGHTING CONTROL".
3. Labels shall be permanently engraved in a contrasting color.
4. Install as shown in the Drawings.
5. Receptacle and faceplate finishes shall be as specified by Architect. Custom finishes may be required.

1.10 CONTROL STATIONS

A. The control system shall have Control Stations located where shown in the Drawings.

B. Wall mounted control stations shall be flush mounted, deadfront, and completely wired internally, with terminals of the proper rating for all external wiring.

C. Panel faceplates shall use no visible means of attachment.

D. Where specified, wall mounted control stations shall have latching covers to protect against accidentally changing presets and/or tampering with the programming.

E. Control Station faceplates shall have beveled edges and rounded corners.

F. Control Station faceplates shall have pushbuttons with backlit button labels. When a preset is active, the button label shall illuminate uniformly via an LED backlight.

G. Labels and legends shall be permanently engraved in a contrasting color.

H. Because the most appropriate faceplate/pushbutton nomenclature will not be determined until after the control system is programmed, initially provide blank, unlabeled faceplates/pushbuttons. After the system has been programmed, and the Owner has agreed to the final nomenclature, new, labeled faceplates and/or pushbuttons shall be provided and installed as part of the work of this Section.

I. Labels and legends shall be as specified by the Lighting Consultant.

J. Faceplate and label finishes shall be as specified by the Architect.

K. The following types of Control Stations shall be provided with this system:

1. Preset Wallstations.

   a. These wallstations shall not program lighting presets. They shall only initiate pre-programmed presets.

   b. The panel faceplates shall contain pushbuttons for the manual activation of a preset and raise/lower buttons to raise and lower all control channels together.

   c. The quantity of presets accessed by each wallstation shall be as noted in the Drawings.

2. The specific control channels and presets that are controlled by each control device shall be determined by the Lighting Consultant.

1.11 INTERFACES

A. Emergency Lighting Interfaces.

1. Interfaces shall allow the lighting control system to receive emergency override signals from the Fire Alarm system. Activation of the Fire Alarm System shall initiate emergency mode operation of the lighting control system.

2. Interfaces shall include a power sensing circuit to detect the loss of normal power. Loss of normal power on one or more phases shall initiate emergency mode operation of the lighting control system.

3. Interfaces shall be located in a non-public area as shown in the Drawings and mounted per the Manufacturer's recommendations.

1.12 AUXILIARY CONTROLS

A. Wireless Occupancy Sensors.

1. Wireless occupancy/vacancy sensor can be programmed to operate as an occupancy sensor (automatic-on and automatic-off functionality) or a vacancy sensor (manual-on and automatic-off functionality).
2. Occupancy sensors shall turn off lighting automatically after reasonable and adjustable time delay once the last person to occupy the space vacates a room or area. Adjustable timeout shall be available for [1], [5], [15], [20] minutes.
3. Occupancy sensors shall provide a grace period per Title 24 requirements to send lights to previous level when motion is detected within 30 seconds of going unoccupied.
4. Occupancy sensors shall be infrared (passive).
5. Occupancy sensor sensitivity shall be adjustable in order to detect movement up to xx feet away from the sensor.
6. Occupancy sensors shall have a 90˚ (or) 180˚ (or) 270˚ (or) 360˚ (or) long range horizontal coverage pattern.
7. Occupancy sensors shall be provided with shielding accessories to mask the viewing window to various sizes and degrees.
8. Occupancy sensors shall provide a clearly visible method of indication to verify that motion is being detected during testing and that the unit is communicating to compatible RF receiving devices.
9. Occupancy sensors shall have optional, readily accessible, user adjustable controls for timeout, automatic/manual-on, and sensitivity.
10. Occupancy sensors shall have a test mode that provides a visual indication from the face of the unit to verify correct sensor placement, coverage and operation.
11. Occupancy sensors shall have an operational lifetime of 10 years without the need to replace batteries when installed per the Manufacturer's recommendations.
12. Occupancy sensors shall incorporate non-volatile memory. Should power be interrupted and subsequently restored, sensor settings saved in protected memory shall not be lost.
13. Occupancy sensors shall communicate directly to compatible RF receiving devices through the use of a radio frequency communications link.
14. Occupancy sensors shall not require any external power packs, power wiring, or communication wiring.
15. Occupancy sensors shall provide RF range between sensor and compatible RF receiving device(s) of 60 feet (18 meters) line of sight or 30 feet (9 meters) through typical construction materials.
16. Occupancy sensors shall comply with the limits for a Class B device, pursuant to part 15 of the FCC rules.
17. System provides ability to add additional timeout system wide without having to make local adjustments on sensor.
18. System capable of providing the following occupied and unoccupied actions
    a. Area level – from 0-100%

b. Preset area scene

c. Daylighting

19. System can be programmed to change the occupied and unoccupied actions based on button presses, timeclock, or BACnet

    a. System can be configured to apply changes immediately or change of state of occupancy.

20. System provides ability to group multiple sensors such that when one sensor seeing occupancy sends the area occupied, but all sensors must trip to go unoccupied.

    a. Further grouping of areas can be achieved such that when one area goes occupied, multiple areas go occupied using the same control logic

    b. System provides occupancy group 1-way dependency feature, which provides the ability to turn on dependent areas (ex. hallways) based on one of many other adjacent controlling areas (ex. private offices) going occupied. For the dependent area to turn off, all controlling areas must be unoccupied. The dependent area going occupied does not make the controlling areas go occupied.

21. System provides the ability to configure areas so that they respond to occupancy sensors only if the area is in an unoccupied state (for when a control station may be hit before the occupancy sensor detects occupancy)

22. Occupancy sensors shall be located as shown in the Drawings and mounted per the Manufacturer's recommendations. The Contractor shall confirm final locations and orientations with the Lighting Consultant prior to installation.

23. The Contractor shall confirm that the occupancy sensor is rated for the temperature and humidity levels present in the area where it will be installed.

24. Occupancy sensors shall be tested and commissioned by a factory trained Manufacturer's technician.

25. Subject to the above requirements, the equipment indicated herein shall be by one of the following manufacturers. Other manufacturers whose equipment meets or exceeds these requirements may be considered with the prior review of the Lighting Consultant. Manufacturers seeking review must contact the Lighting Consultant not later than fourteen (14) days prior to bid date.

    a. Basis of Design: Lutron Electronics, Coopersburg, Pennsylvania

B. Wireless Photocells.

1. Photocells shall utilize an open-loop basis for daylight sensor control scheme.

2. Photocells shall be capable of measuring illuminance levels within a range that includes 0 to 10,000 footcandles.

3. Photocells shall have an operational lifetime of 10 years without the need to replace batteries when installed per the Manufacturer's recommendations.

4. Photocells shall incorporate non-volatile memory. Should power be interrupted and subsequently restored, sensor settings saved in protected memory shall not be lost.

5. Photocells shall communicate directly to compatible RF receiving devices through the use of a radio frequency communications link.

6. Photocells shall not require any external power packs, power wiring, or communication wiring.

7. Photocells shall provide RF range between sensor and compatible RF receiving device(s) of 60 feet (18 meters) line of sight or 30 feet (9 meters) through typical construction materials.
8. Photocells shall comply with the limits for a Class B device, pursuant to part 15 of the FCC rules.
9. Photocells shall offer a built-in delay to ensure that lightning or other events that create a sudden, temporary increase in the ambient lighting do not inadvertently switch the controlled lighting loads on or off.
10. In order to prevent nuisance tripping of lighting loads, photocells shall include a deadband to ensure that the photosensor signal, or illuminance value, that turns lights off is higher than the signal, or illuminance value, that turns the lights back on.
11. Photocells shall be provided with shielding accessories to mask the viewing window to various sizes and degrees.
12. Photocells shall be provided with multiple filters or screens that can be mounted to the photocell to alter the illuminance detection range.
13. The Contractor shall confirm that the photocell is rated for the temperature and humidity levels present in the area where it will be installed.
14. Subject to the above requirements, the equipment indicated herein shall be by one of the following manufacturers. Other manufacturers whose equipment meets or exceeds these requirements may be considered with the prior review of the Lighting Consultant. Manufacturers seeking review must contact the Lighting Consultant not later than fourteen (14) days prior to bid date.
    a. Basis of Design: Lutron Electronics, Coopersburg, Pennsylvania

1.13 POWER PANELS

A. Dimmer Panels.

1. Physical requirements.
    a. Dimmer Panels shall be deadfront, substantially framed, and enclosed with sheet metal panels. Access for installation and maintenance shall be provided through the front of the panels. All parts shall be properly cleaned prior to painting and then painted with a rust inhibiting primer. The finish paint shall be baked enamel.
    b. Each dimmer shall be clearly labeled with circuit / dimmer number.
    c. Connections and test points shall be accessible through the front of the panels.
    d. The panel shall incorporate a front locking door to cover all user-operable portions of its components.
    e. Panel identification labels shall be bolted or riveted to the front of the panel, and read "DIMMERS (Beginning no.)—(End no.)" Labels shall be engraved lamicoid.
    f. Panels shall include a permanent, clear plastic sleeve for insertion of an 8-1/2” x 11” panel schedule by the Contractor. Sleeves shall be mounted in an accessible location in or on each panel.
2. Electrical Requirements.
    a. Dimmer Panels shall be designed to operate at a voltage of 120/208 volts, 60 Hz, 3-phase 4-wire, with the main busses of each panel sized for maximum full loading of all contained dimmers.

b. Dimmer Panels shall be completely wired internally, and terminals of the proper rating shall be provided for all external connections. Each terminal shall be clearly and permanently marked and numbered.

c. All dimming and control components shall be easily removable for repair or replacement via multi-conductor connectors.

d. Dimmer Panels shall be designed and tested to withstand surges, without impairment to performance, of 6000V, 3000A (equivalent to a near lightning strike).

e. In order to protect control components from a catastrophic failure of voltage isolation at the dimmer module, the Dimmer panel shall incorporate additional isolation between control voltage of all control devices and line voltage of dimmers. Isolation shall be in excess of 2500 volts RMS. This isolation shall be in addition to any isolation provided in each dimmer. If the dimmer panel includes a control signal output receptacle, isolation shall be incorporated to protect the control signal leaving the panel.

3. Thermal requirements.

a. Forced air or convection ventilation shall be provided as required by the Manufacturer to keep the dimmers within safe operating temperature.

b. Each panel shall contain an electronic system to monitor the temperature within the panel. This system shall shut down the panel and activate a warning light should the safe operating temperature of the panel be exceeded.

4. Provide and deliver to Owner at least one spare electronic control module.

5. If necessary to ensure proper air ventilation, provide and install blank filler modules in all unfilled dimmer module spaces. Provide placard on inner face of dimmer panel door, reading: "CAUTION—FILL ALL EMPTY PANEL SLOTS WITH BLANK MODULES. DO NOT OPERATE DIMMERS UNLESS ALL SLOTS ARE FILLED."

6. Install where shown on drawings and as recommended by the Manufacturer.

B. Dimmers.

1. Acoustical requirements.

a. Dimmers shall be equipped with firing circuitry and filtering designed to reduce "filament sing" attributable to rapid electronic switching of the AC waveform.

b. Rise time shall not be less than 500 microseconds measured at 90 degree conduction angle, at the dimmer's full rated load.

2. Electrical requirements.

a. Dimmers shall be designed to operate at a line voltage of 120 volts, 60 Hz.

b. Panels shall include fully magnetic or thermal magnetic circuit breakers to serve as disconnecting devices and to provide branch circuit protection.

c. For panels using plug-in dimmers, each dimmer space shall be completely factory wired, with power and control connections between the Dimmer Module and the Dimmer Panel provided through permanently installed, oversized, self-aligning pin connectors located at the rear of the module.

3. Electronic requirements.

a. Dimmers shall be fully solid state, and shall utilize one of the following technologies:

1) IGBT. A microprocessor and 2 Insulated Gate BiPolar Transistors (IGBTs) which produce a reverse phase control (RPC) output waveform.

2) SCR. Two silicon controlled rectifiers in a back-to-back electrical configuration that provide, at all times, a symmetrical alternating current output.

3) TRIAC. Three terminal semiconductor used for controlling current in forward and reverse directions.

b. All dimmers (except IGBT) shall include integral inductive toroidal filter to reduce the rate of current rise, to isolate the dimmer from the AC line to prevent interaction with other dimmers, and to limit conducted radio frequency interference.

c. Dimmers shall be designed to operate within a normal ambient temperature of 0 degrees C. to 40 degrees C. and in normal relative humidities of 20% to 90% with no adverse effects.

d. The output voltage versus control position (curve) shall be factory adjusted to conform to the IES square law dimming curve.

e. Response time shall not exceed 20msec (or 50 cycles/second).

f. Power efficiency shall exceed 95% at any voltage and at any load.

g. Isolation between the AC line and control circuit shall be in excess of 2500 volts RMS.

PART 3 EXECUTION

1.14 FABRICATION

A. Panels and cabinets shall be welded assemblies of sheet steel or aluminum or bar size angles, channels, and tees or aluminum extrusions forming rigid enclosures to support internal components.

B. Operating elements shall be mechanically safe and electrically "dead."

C. Steel parts and panels shall be cleaned and primed with rust inhibiting primer. Exterior finishes shall be epoxy resin or baked enamel in matte black, or in Manufacturer's standard color where not specified.

D. Internal wiring shall be factory completed, in harnesses, and bound. No loose or randomly routed wires shall be permitted.

E. Wire sizes and insulations shall comply with NEC, UL, and local codes and meet or exceed electronics industry standards.

1.15 PACKING AND SHIPPING

A. Equipment shall be wrapped and sealed in polyethylene and substantially crated for shipment. Crates shall clearly indicate equipment contained, nature of components, and job site allocation.

1.16 INSTALLATION

A. Install all items in conformity with standard trade practices and Manufacturer's recommendations.

B. Consult and coordinate work with trades doing adjoining work.

C. Position all items accurately as indicated in the Drawings, and true to plumb line and level. Maintain maximum headroom and clearance at all points.

D. Where noted on the drawings, the exact location of equipment shall be confirmed in the field with the consultation of the Architect and Lighting Consultant prior to installation.

E. Many equipment locations are determined to provide maximum performance and accessibility for maintenance. When field conditions require equipment to be relocated, it is the Contractor's responsibility to notify the Architect and Lighting Consultant prior to installation.

F. Confirm all of the control wiring with the control system manufacturers.

G. Contractor shall confirm that photocell placement and orientation is consistent with Manufacturer's recommendations. Direct views of electric light sources shall be minimized.

H. For each power and dimmer panel, the Contractor shall provide an 8-1/2" x 11" spreadsheet that identifies the following items for each circuit:

1. Panel Contactor/Dimmer Number
2. Lighting Consultant Contactor/Dimmer Number
3. Manufacturer Control Channel Number
4. Lighting Consultant Control Channel Number
5. Area
6. Load Description
7. Electrician's Wire Number
8. Fixture Type
9. Watts per Fixture
10. Fixture Quantity
11. Total Connected Load
12. Load Type
13. Dim or Non-Dim Circuit

I. If requested by the Specification, the Contractor shall install all of the control station faceplates after the engraving and/or special labeling is completed.

J. Complete thorough cleanup.

1.17 SYSTEM COMMISSIONING

A. Notify the Control System Manufacturer at least 15 business days prior to project completion in order to schedule the system energization and commissioning. The system shall be commissioned by a Manufacturer approved Field Technician.

B. The Manufacturer shall provide the Contractor with a checklist of all work that must be completed prior to the initial Field Technician site visit.

C. The Field Technician shall check all components and installed wiring to ensure compliance with Manufacturer recommendations. The Field Technician shall configure, energize, and operate all system components to ensure operational compliance with this Specification.

D. The Field Technician shall configure and/or verify all Area, Control Channel, Preset, and Daylight Harvesting identification and assignments.

E. The system energization and commissioning shall be completed prior to the lighting control system programming session(s).

F. The Manufacturer shall send one (1) Field Technician to the site for a minimum of three (3) separate, eight (8) hour visits to:

1. Commission the system as noted above.
2. Program the system with the assistance of the Lighting Consultant.
3. Train representatives of the Owner on the operation, use, and maintenance of the system.

1.18 SYSTEM PROGRAMMING AND ADJUSTMENT

A. Notify the Architect and Lighting Consultant at least 10 business days in advance of the project completion date in order to schedule the system programming sessions.

B. Areas, Control Channels, and Presets shall be pre-programmed into the Control System by the Manufacturer. Each of these items shall be capable of being field-modified as needed during the system programming session(s).

C. The daylight harvesting controls, including photocell sensitivity settings and time delays, shall be programmed by the Manufacturer. Confirm the target light level settings for each space with the Lighting Consultant before programming these areas.

D. The final system programming for areas listed in Section 1.1.A shall be supervised by the Lighting Consultant. Programming shall take place after all fixture focusing is complete, filters and other accessories are installed. Programming shall also take place after all window shades are installed and fully functional.

E. Manufacturer shall confirm if daylight harvesting control programming needs to be performed at certain times of day (based on the room/window orientation) and/or during certain sky conditions in order to properly calibrate photocells and program electric light levels.

F. Necessary adjustments and/or modifications shall be made as required by the Manufacturer’s Field Technician.

G. The Contractor shall coordinate with the other trades and the Owner to ensure that programming sessions are scheduled during times when all of the light fixtures can be turned off / on during the entire duration of the sessions, and when the space(s) are unoccupied for other purposes.

H. The Contractor shall provide all ancillary equipment, such as tables and chairs, for the entire duration of the programming sessions.

I. The Contractor shall provide a crew of one (1) person for one (1) afternoon-to-evening programming session.

J. The Contractor shall provide factory certified personnel to assist in the programming of the system for the entire duration of the programming sessions.

K. The Contractor shall, at the consultant's current hourly rates, reimburse the Lighting Consultant for all time and expenses incurred for any additional programming sessions that are required due to:

1. Incomplete or incorrect installation.
2. Insufficient crew.
3. Lack of access to all equipment.
4. Missing, malfunctioning, or incorrect equipment.
5. Equipment and/or obstructions in the space that are between a fixture and its intended aiming point.

L. Upon completion of all installation and programming work, the Contractor shall certify in writing to the Architect that the work is complete and ready for final review.

M. The Owner, Architect, and Lighting Consultant shall conduct the final review within fourteen (14) days of the Contractor's notice of completion. The Manufacturer's Field Technician shall operate the system during the review.

1.19 SYSTEM TRAINING

A. The Manufacturer shall provide qualified personnel at the site to instruct the Owner's staff or representatives in the operation, programming, and maintenance of the system.

B. The Contractor shall schedule the system training session in advance to ensure that the Manufacturer Field Technician will be on-site for training at a time when all of the pertinent representatives of the Owner are available.

C. The instruction session shall be scheduled to last a minimum of four (4) hours. While it may be possible to schedule this instruction session to coincide with the system commissioning and/or programming, such coincidence shall not be assumed.

D. Provide to the Owner video recorded instructions on the operation and maintenance of the system.

1. Information contained in video shall cover all points of operation and maintenance covered in the instruction session with Owner's staff. A video recording of the actual instruction session is acceptable.
2. The video and audio of the recording shall be of sufficient quality that all instructor dialogue contained in the video shall be intelligible and all presented visual information shall be discernable on the recording.
3. Video format shall be electronic media.
4. Provide (2) full copies.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE

A. This specification Section applies to the following spaces:

1. Vestibule
2. Stair
3. Foyer
4. Rotunda
5. Friend’s Reading Room
6. Reference Room
7. Reference Annex

Although this system may feed or control fixtures outside of the areas listed above, specification and review for all such areas shall be by the Architect and Electrical Engineer.

B. All materials, components, and services necessary to provide a complete system indicated in this Section, as specified herein and shown on related Drawings, including:

1. Verification of dimensions and conditions at the job site to ensure proper fitting of the work.
2. Preparation and submission of complete control system shop drawings and samples for review prior to fabrication.
3. Shipment of equipment to the job site.
4. Installation and completion in accordance with these Specifications, related Drawings, the Equipment Manufacturer's recommendations, established trade criteria, and all applicable code requirements.
5. The inspection, demonstration, and necessary adjustment of the completed installation by the Manufacturer's engineering personnel.
6. Preparation and submission of complete record drawings and operational and maintenance data and certificates.
7. Warranty coverage as required herein.

1.2 WORK INCLUDED

A. Interfaces and accessories

B. Specialty lighting controls

C. Dimmers and dimming panels

D. Lighting contactor panels

E. Emergency dimming panels

The above is for reference only and is not intended to define the limits of the work for a complete installation.

1.3 RELATED WORK IN OTHER SECTIONS

A. General requirements for all electrical work

B. Electrical service

C. Wiring devices for electrical distribution

D. Lighting Control Systems for spaces not listed in Section 1.1.A above.

E. Lighting Fixtures

F. Audio Visual Systems

G. Building Automation Systems

H. Fire Alarm Systems

I. Information Technology Systems

1.4 QUALIFICATIONS

A. Dimming and control system equipment shall be provided by qualified Lighting Control Manufacturers.

B. Manufacturers shall have at least ten (10) years of experience in the fabrication of similar equipment.

C. If requested, Manufacturers shall submit a representative list of installations similar in scope to this project during the above period.

D. Subject to the above requirements, the equipment indicated herein shall be by one of the following manufacturers:

1. Lutron Electronics, Coopersburg, Pennsylvania

E. Manufacturers that are not listed as the Basis of Design may be considered with the prior review of the Lighting Consultant. Manufacturers seeking review must contact the Lighting Consultant not later than ten (10) days prior to bid date.

F. The Manufacturer shall be responsible for the integration, operation, and performance of all elements of the system described in this Section. The Manufacturer shall provide all warranty work and equipment upgrades as called for in this Section. The Manufacturer and/or a factory-authorized representative shall be available for product service onsite within (24) hours of a call for service.

1.5 SUBMITTALS

A. Pre bid.

1. Substitutions.

a. Requests for substitutions shall be made no less than ten (10) business days prior to bid due date. No requests for substitutions shall be considered after this time.

b. Manufacturers that are not listed in Section 1.4 shall submit the following, in addition to the requirements of Section 1.5.C:

1) A statement proving that the Manufacturer meets all of the qualifications as set forth in Section 1.4 above, including a list of representative installations similar in scope to this project. Include the Owner contact names and phone numbers as references.

2) A proposal fully explaining how the system will meet the requirements of this Specification. The proposal shall include, but not be limited to panel schedules, one line diagrams, and cutsheets and full specifications for all of the system components.

3) A full listing of all fixture types, including catalog numbers, with proposed changes to the dimming drivers and ballasts for compatibility with the control system.

4) Product samples and/or mock-ups as requested by the Lighting Consultant.

c. Specified products are known to be available at the time of construction. Should the Contractor discover that any equipment may be unavailable, it is the Contractor's responsibility to notify the Architect not less than ten (10) business days prior to bid.

d. Owner Directed Changes. If the Owner directs the Contractor to submit an alternate control system for the purpose of reducing the costs, substitutions shall meet or exceed the quality and capabilities of the specified system. Such requests for substitutions shall be submitted in accordance with the requirements of section 1.5.C.

e. If a proposed substitute fails to comply with the Specification requirements, the Contractor shall furnish the acceptable control system at no additional cost to the Owner, and with no delay to the project.

B. With bid.

1. All deviations and exceptions from this Specification must be revealed with bid. Deviations and exceptions from the Specification submitted after this time shall not be accepted, whether or not these variations have been formally or informally accepted by the Architect or Lighting Consultant.

2. Manufacturers' catalog numbers listed in the drawings are included to aid in control system/component identification. These numbers are subject to periodic change by manufacturers and therefore need to be used in conjunction with the system descriptions. Incomplete or obsolete catalog numbers do not indemnify the Contractor from providing equipment as described in the drawings and in this Specification.

3. Manufacturer shall indicate any additional wire or conduit runs that are not shown in the Drawings that will be required to install Manufacturer's system.

4. Control System Lead Times. Many control systems require substantial lead times for delivery. It is the Contractor's responsibility to verify lead times and to notify the Architect within 2 weeks of contract award if any lead time will not allow them to meet the schedule for project completion.

C. Shop drawings. The Contractor shall submit shop drawings to the Architect, Lighting Consultant, and Electrical Engineer for review prior to fabrication. The contents of the shop drawings shall be prepared by the Manufacturers and/or the Manufacturers' Representatives. Shop drawings prepared solely by a Distributor or Contractor will not be acceptable. If the Lighting Consultant is required to review submittals prepared by a Distributor / Contractor, and

is then required to re-review submittals for the same equipment prepared by a Manufacturer / Manufacturers Representative, the Contractor shall reimburse the Lighting Consultant, at their current hourly rates, for the duplicate time and expenses incurred. Shop drawings shall contain, at a minimum, the following information:

1. Dimensions, components, and finishes of all equipment and accessories.
2. All system assemblies and major sub-assemblies, cabinets, and enclosures, including notation of type and Manufacturer of switches, pilot lights, locks, hardware, and electrical and electronic connectors.
3. Block schematics of system internal wiring and system element interconnection.
4. Panel schedules showing circuit descriptions, control channel descriptions, load types, etc.
5. Control station cutsheets showing station sizes, mounting details, button configurations, preset labels, engraving information, etc.
6. Comprehensive system one-line diagram.
7. Indication of lead time for delivery.
8. Quantities of each component and sub-assembly.
9. Indication by boxed caption of any and all variations from contract Drawings and Specifications, whether or not these variations have been formally or informally accepted by the Architect or Lighting Consultant.
10. Standard catalog cut sheets with insufficient information will not be accepted.
11. Submittals must be prepared by the Manufacturer and/or their local Representative. Submittals prepared by the Distributor or Contractor without the assistance of the Manufacturer and/or their local Representative will not be reviewed or accepted.

D. Samples. Within sixty (60) days of receipt of order, submit to the Architect for review prior to fabrication:

1. Samples of faceplates and faceplate engravings.
2. Samples of any equipment component requested by the Lighting Consultant.

Samples shall not be included in quantities of equipment specified but shall be returned.

E. Pending Items. The Contractor shall submit a schedule of lead times for pending items such as faceplate engravings.

F. Final submittal. Within thirty (30) days of final tests, and as a condition for final review, shall submit to the Architect:

1. Receipts for delivery of all non-installed items, i.e., all items designated, "deliver to Owner."
2. Five (5) bound sets to the Architect, and one (1) bound set to the Lighting Consultant:
   a. "As built and approved" drawings showing all systems and components as installed, including all field modifications.
   b. Operating and maintenance manuals.
   c. Parts lists.
   d. Certificates of warranty, as set forth below.

1.6 GENERAL REQUIREMENTS

A. General Conditions of the project contract, work schedules, and site regulations apply to this work.

B. This work shall comply with local codes and applicable NEC and UL standards. All components shall carry pertinent labels of a Nationally Recognized Testing Laboratory (NRTL), such as UL or ETL.

C. The Contractor shall provide full insurance against loss or damage during shipment, storage, installation, and testing. Certification of such coverage shall be furnished to the Architect within thirty (30) days of award of contract.

D. Warranty.

1. Unconditionally warrant all equipment and systems provided under this Section to be free from defects in materials and workmanship for a period of at least twelve (12) months from the date of final acceptance of all work of this Section. Replacement of faulty materials and the cost of labor required for the replacement shall be the responsibility of the Contractor.

2. Appropriate additional equipment to replace equipment removed for service shall be provided at the job site at no expense to the Owner to replace any and all equipment that must be removed for service. Replacement equipment must be the same model that was removed for service.

3. Warranty service shall be performed by personnel in the employ of the Manufacturer and shall not be sub-contracted or assigned to another company, service, or individual unless the Owner has approved such assignment in writing, in which event the Manufacturer shall nevertheless be responsible to the Owner for such work.

E. For a period of two (2) years following acceptance, the Manufacturer shall provide and install, at no cost to the Owner, all operating system upgrades. Thereafter, the Manufacturer shall notify the Owner of all operating system upgrades for the life of the control system. The Manufacturer shall keep the system user's name and address in a database for this purpose. All upgrades shall include a full written description of operational modifications. System upgrades shall be designed so as to allow existing data to be accessed and upgraded.

F. For a period of five (5) years following acceptance, the Manufacturer shall maintain service capability by guaranteeing a factory-authorized representative available for on-site service calls within twenty-four (24) hours of notification by Owner of a need for service.

G. State-of-the-art Assurance.

1. All products specified shall be the Manufacturer’s most recent iteration and most recent product. No products shall be accepted if they have been discontinued or superseded at the time of shipment. Should the Manufacturer develop products of comparable function above and beyond the specification of the listed product, the Contractor shall notify the Architect and the Lighting Consultant of any developments to the specified products and shall note any change in the requirements of building infrastructure(s) to support the developments. The Architect and Lighting Consultant shall then determine whether upgraded products shall be accepted.

PART 2 PRODUCTS

1.7 GENERAL

A. The entire Control System shall be the responsibility of a single Manufacturer unless otherwise approved in writing by the Lighting Consultant.

B. Provide, as part of the work of this Section, one computer, complete with programming software, for the purpose of programming the lighting system. The computer shall meet the Manufacturer's requirements and shall be available during the Factory Technician's system turn-on and programming sessions.

C. Materials shall be new and free from defects that in any manner may impair their character, appearance, strength, durability, and function. Materials shall be effectively protected from any damage from the time of fabrication until final acceptance of the work.

D. Verify equipment mounting conditions, clearances, and structural mounting supports prior to the procurement of equipment.

E. Notify the Architect immediately of any conflicts between the specified equipment and the actual mounting conditions.

F. Provide mounting hardware as required for a complete installation.

G. Provide equipment complete with accessories, interfaces, repeaters, boosters, amplifiers, etc. as required, as shown on the Drawings, and as required by this Specification.

H. The construction and operation of the power panels shall meet all applicable local and national codes.

I. Equipment shall carry labels of a Nationally-Recognized Testing Laboratory (NRTL), such as UL or ETL. Such labels shall be permanently attached in a conspicuous location that does not affect performance or aesthetics.

J. Components shall bear labels identifying the Manufacturer, model number, and serial number. Such labels shall be permanently attached in a conspicuous location that does not affect performance or aesthetics .

K. Refer to the one-line diagram and schedules in the Drawings for additional information.

1.8 SYSTEM OVERVIEW

A. The interior emergency and architectural lighting for areas listed in Section 1.1.A shall be fed and controlled by a single Control System. All other lighting fixtures shall be fed and controlled as shown in the Drawings and corresponding Specification section.

B. The Control System shall switch or dim the lighting fixtures in response to user input, daylight harvesting/photocell input, A/V interface input, etc. Areas with dimming shall have different presets, or "lighting looks", that are programmed in the field and can be easily recalled. The lighting controls shall interface with various systems, where required, including audio visual controls, motorized window shade controls, photocells, etc.

C. In areas with daylight harvesting controls, photocells shall monitor the available daylight and dim the associated lighting fixtures accordingly. Daylight harvesting controls shall override the light level settings in any given preset. Users shall be able to dim light levels further below the

daylight harvesting levels through pushing the "down" dimming button on control stations. Users shall not be able to raise light levels above the daylight harvesting levels.

D. The Control System shall have one control processor or server that can monitor, control, and program (live or off-line) all Areas, Control Channels, and Presets that are part of the system.

E. For everyday use, Wallstations shall initiate Presets. In some spaces, Presets can also be initiated by A/V controls that interface with the lighting controls.

F. The Control System shall have the following minimum capacities:

1. Digital Communication Busses to accommodate all digitally addressable drivers
2. 32 Control Channels per Area
3. 5 Presets per Area

Refer to the one-line diagram and control channel schedules in the Drawings for additional information. Contractor and Manufacturer shall verify actual capacities required for the system.

G. The Control System shall be able to:

1. Assign dimmers and digitally addressable drivers to specific Control Channels
2. Determine the number and names of Areas
3. Define the number and names of Control Channels and Presets per Area
4. Assign Control Channels to specific Areas
5. Define the functionality of all Control Stations
6. Customize the labeling of Areas, Control Channels, Presets, and Control Stations as directed by the Lighting Consultant
7. Set the astronomic timeclock based on project location and daylight savings time
8. Accommodate tunable white mixing
9. Accommodate hours of operation monitoring, recording, and notification to End User
10. Provide real-time and historical energy usage reports to End User
11. Provide system maintenance reports to End User
12. Accommodate automated load shedding
13. Accommodate Space Utilization reporting to End User

H. The Control System shall have interfaces that allow communication between the Control System, building automation system, audio visual system, photocells, motion sensors, computer laptop, etc., and the dimmers and contactors. Interfaces shall be capable of communicating using one or more of the following control protocols:

1. TCP/IP (Ethernet)
2. RS232
3. DMX512
4. Contact Closure

I. When more than one control device is connected to the Control System at the same time, dimmers and contactors shall respond on a last-action-takes-precedence basis.

J. Control Channels. A control channel is a circuit or group of circuits that are controlled together. A control channel may include circuits from multiple panels, and may include dim and/or non-dim circuits.

1. The Control System shall be capable of electronically assigning circuits to control channels. No one circuit shall be on more than one control channel.
2. Each Control Channel shall have its own, distinct name. Names shall be determined by the Lighting Consultant and are specified in the control channel schedule(s). Control Channels shall be pre-programmed into the Control System by the Manufacturer. Control Channels shall be modified as needed once the system is installed.
3. Dimmable Control Channels for LED, fluorescent, and neon sources shall have a field-customized high-end curve to ensure that these sources do not flicker between 0% and the low end of their range.
4. Dimmable Control Channels for halogen and incandescent sources shall have a field-customized high-end trim to ensure that these sources are never operating at a true 100%, in order to extend lamp life.

K. Presets. A preset is a specific lighting “look” created by programming various Control Channels to different intensities that can be simply recalled.

1. The Control System shall be capable of electronically “locking” presets once they are programmed in order to prevent unauthorized tampering with the system.
2. Presets shall be capable of being initiated by:
   a. Preset Control Stations
   b. Timeclocks
   c. Building Automation Systems
   d. Occupancy / vacancy sensors
   e. Photocells
   f. External Audio Visual equipment
   g. Other external devices via dry contacts
3. Presets shall be programmed into the Control System once the system is installed.
4. When a new preset is initiated, the Control System shall cross-fade from the previous preset to the new preset. The fade time shall be determined by the Lighting Consultant during the programming sessions.
5. The Manufacturer shall confirm the Preset names with the Lighting Consultant prior to programming the Control System.

L. Areas. An Area is a set of Control Channels that can be programmed independently of other Control Channels.

1. Areas shall have their own, distinct Presets.
2. Each room shall be programmed as a separate Area.
3. Areas shall be pre-programmed into the Control System by the Manufacturer. Areas shall be modified as needed once the system is installed.

M. The following Control Systems shall be acceptable. Do not substitute.

1. Basis of Design: Lutron “Athena”

1.9 PROGRAMMING COMPONENTS

A. Lighting Control Processor.

1. The Lighting Control Processor shall be pre-programmed by the Manufacturer to include all of the Areas, Control Channels, load types, etc. as specified in the control schedules in the Drawings. Specific lighting levels and fade times shall be programmed in the field. The Lighting Control Processor shall be programmed via a laptop computer with a "Windows" operating system. The laptop shall be linked to the Lighting Control Processor via a control receptacle and/or interface adaptor. The software used to program the Lighting Control Interface shall be supplied by the Manufacturer.
2. The programming software shall be capable of receiving programming data from all of the following sources:
    a. CD, USB memory stick, or SD memory card
    b. Modem
    c. Computer
    d. Handheld Programmer
3. Control stations shall provide power failure memory so that lights come back on to the same levels as prior to the power interruption.
4. Provide and install Lighting Control Processor as shown in the Drawings.

B. Programming Software.

1. The Control System software shall be able to:
    a. View the status of all Areas, Presets, Control Channels, and fade times.
    b. Print a summary of the Areas, Presets, Control Channels, and Control Stations.
2. Provide the Owner with one copy of all programming software and any necessary Manufacturer training in the use of the software. All costs for software and/or training shall be included as part of the work of this Section.

C. Control Receptacle Panel.

1. The face of the panel shall contain flush mounted receptacles. These receptacles shall be of the locking type and shall be sized for the proper number and capacity of conductors as indicated in the Drawings.
2. Receptacles shall be provided for a laptop hook-up, and shall be labeled, "LIGHTING CONTROL".
3. Labels shall be permanently engraved in a contrasting color.
4. Install as shown in the Drawings.
5. Receptacle and faceplate finishes shall be as specified by Architect. Custom finishes may be required.

1.10 CONTROL STATIONS

A. The control system shall have Control Stations located where shown in the Drawings.

B. Wall mounted control stations shall be flush mounted, deadfront, and completely wired internally, with terminals of the proper rating for all external wiring.

C. Panel faceplates shall use no visible means of attachment.

D. Where specified, wall mounted control stations shall have latching covers to protect against accidentally changing presets and/or tampering with the programming.

E. Control Station faceplates shall have beveled edges and rounded corners.

F. Control Station faceplates shall have pushbuttons with backlit button labels. When a preset is active, the button label shall illuminate uniformly via an LED backlight.

G. Labels and legends shall be permanently engraved in a contrasting color.

H. Because the most appropriate faceplate/pushbutton nomenclature will not be determined until after the control system is programmed, initially provide blank, unlabeled faceplates/pushbuttons. After the system has been programmed, and the Owner has agreed to the final nomenclature, new, labeled faceplates and/or pushbuttons shall be provided and installed as part of the work of this Section.

I. Labels and legends shall be as specified by the Lighting Consultant.

J. Faceplate and label finishes shall be as specified by the Architect.

K. The following types of Control Stations shall be provided with this system:

1. Preset Wallstations.

   a. These wallstations shall not program lighting presets. They shall only initiate pre-programmed presets.

   b. The panel faceplates shall contain pushbuttons for the manual activation of a preset and raise/lower buttons to raise and lower all control channels together.

   c. The quantity of presets accessed by each wallstation shall be as noted in the Drawings.

2. The specific control channels and presets that are controlled by each control device shall be determined by the Lighting Consultant.

1.11 INTERFACES

A. Emergency Lighting Interfaces.

1. Interfaces shall allow the lighting control system to receive emergency override signals from the Fire Alarm system. Activation of the Fire Alarm System shall initiate emergency mode operation of the lighting control system.

2. Interfaces shall include a power sensing circuit to detect the loss of normal power. Loss of normal power on one or more phases shall initiate emergency mode operation of the lighting control system.

3. Interfaces shall be located in a non-public area as shown in the Drawings and mounted per the Manufacturer's recommendations.

1.12 AUXILIARY CONTROLS

A. Wireless Occupancy Sensors.

1. Wireless occupancy/vacancy sensor can be programmed to operate as an occupancy sensor (automatic-on and automatic-off functionality) or a vacancy sensor (manual-on and automatic-off functionality).
2. Occupancy sensors shall turn off lighting automatically after reasonable and adjustable time delay once the last person to occupy the space vacates a room or area. Adjustable timeout shall be available for [1], [5], [15], [20] minutes.
3. Occupancy sensors shall provide a grace period per Title 24 requirements to send lights to previous level when motion is detected within 30 seconds of going unoccupied.
4. Occupancy sensors shall be infrared (passive).
5. Occupancy sensor sensitivity shall be adjustable in order to detect movement up to xx feet away from the sensor.
6. Occupancy sensors shall have a 90˚ (or) 180˚ (or) 270˚ (or) 360˚ (or) long range horizontal coverage pattern.
7. Occupancy sensors shall be provided with shielding accessories to mask the viewing window to various sizes and degrees.
8. Occupancy sensors shall provide a clearly visible method of indication to verify that motion is being detected during testing and that the unit is communicating to compatible RF receiving devices.
9. Occupancy sensors shall have optional, readily accessible, user adjustable controls for timeout, automatic/manual-on, and sensitivity.
10. Occupancy sensors shall have a test mode that provides a visual indication from the face of the unit to verify correct sensor placement, coverage and operation.
11. Occupancy sensors shall have an operational lifetime of 10 years without the need to replace batteries when installed per the Manufacturer's recommendations.
12. Occupancy sensors shall incorporate non-volatile memory. Should power be interrupted and subsequently restored, sensor settings saved in protected memory shall not be lost.
13. Occupancy sensors shall communicate directly to compatible RF receiving devices through the use of a radio frequency communications link.
14. Occupancy sensors shall not require any external power packs, power wiring, or communication wiring.
15. Occupancy sensors shall provide RF range between sensor and compatible RF receiving device(s) of 60 feet (18 meters) line of sight or 30 feet (9 meters) through typical construction materials.
16. Occupancy sensors shall comply with the limits for a Class B device, pursuant to part 15 of the FCC rules.
17. System provides ability to add additional timeout system wide without having to make local adjustments on sensor.
18. System capable of providing the following occupied and unoccupied actions
    a. Area level – from 0-100%

b. Preset area scene

c. Daylighting

19. System can be programmed to change the occupied and unoccupied actions based on button presses, timeclock, or BACnet

    a. System can be configured to apply changes immediately or change of state of occupancy.

20. System provides ability to group multiple sensors such that when one sensor seeing occupancy sends the area occupied, but all sensors must trip to go unoccupied.

    a. Further grouping of areas can be achieved such that when one area goes occupied, multiple areas go occupied using the same control logic

    b. System provides occupancy group 1-way dependency feature, which provides the ability to turn on dependent areas (ex. hallways) based on one of many other adjacent controlling areas (ex. private offices) going occupied. For the dependent area to turn off, all controlling areas must be unoccupied. The dependent area going occupied does not make the controlling areas go occupied.

21. System provides the ability to configure areas so that they respond to occupancy sensors only if the area is in an unoccupied state (for when a control station may be hit before the occupancy sensor detects occupancy)

22. Occupancy sensors shall be located as shown in the Drawings and mounted per the Manufacturer's recommendations. The Contractor shall confirm final locations and orientations with the Lighting Consultant prior to installation.

23. The Contractor shall confirm that the occupancy sensor is rated for the temperature and humidity levels present in the area where it will be installed.

24. Occupancy sensors shall be tested and commissioned by a factory trained Manufacturer's technician.

25. Subject to the above requirements, the equipment indicated herein shall be by one of the following manufacturers. Other manufacturers whose equipment meets or exceeds these requirements may be considered with the prior review of the Lighting Consultant. Manufacturers seeking review must contact the Lighting Consultant not later than fourteen (14) days prior to bid date.

    a. Basis of Design: Lutron Electronics, Coopersburg, Pennsylvania

B. Wireless Photocells.

1. Photocells shall utilize an open-loop basis for daylight sensor control scheme.

2. Photocells shall be capable of measuring illuminance levels within a range that includes 0 to 10,000 footcandles.

3. Photocells shall have an operational lifetime of 10 years without the need to replace batteries when installed per the Manufacturer's recommendations.

4. Photocells shall incorporate non-volatile memory. Should power be interrupted and subsequently restored, sensor settings saved in protected memory shall not be lost.

5. Photocells shall communicate directly to compatible RF receiving devices through the use of a radio frequency communications link.

6. Photocells shall not require any external power packs, power wiring, or communication wiring.

7. Photocells shall provide RF range between sensor and compatible RF receiving device(s) of 60 feet (18 meters) line of sight or 30 feet (9 meters) through typical construction materials.
8. Photocells shall comply with the limits for a Class B device, pursuant to part 15 of the FCC rules.
9. Photocells shall offer a built-in delay to ensure that lightning or other events that create a sudden, temporary increase in the ambient lighting do not inadvertently switch the controlled lighting loads on or off.
10. In order to prevent nuisance tripping of lighting loads, photocells shall include a deadband to ensure that the photosensor signal, or illuminance value, that turns lights off is higher than the signal, or illuminance value, that turns the lights back on.
11. Photocells shall be provided with shielding accessories to mask the viewing window to various sizes and degrees.
12. Photocells shall be provided with multiple filters or screens that can be mounted to the photocell to alter the illuminance detection range.
13. The Contractor shall confirm that the photocell is rated for the temperature and humidity levels present in the area where it will be installed.
14. Subject to the above requirements, the equipment indicated herein shall be by one of the following manufacturers. Other manufacturers whose equipment meets or exceeds these requirements may be considered with the prior review of the Lighting Consultant. Manufacturers seeking review must contact the Lighting Consultant not later than fourteen (14) days prior to bid date.
    a. Basis of Design: Lutron Electronics, Coopersburg, Pennsylvania

1.13 POWER PANELS

A. Dimmer Panels.

1. Physical requirements.
    a. Dimmer Panels shall be deadfront, substantially framed, and enclosed with sheet metal panels. Access for installation and maintenance shall be provided through the front of the panels. All parts shall be properly cleaned prior to painting and then painted with a rust inhibiting primer. The finish paint shall be baked enamel.
    b. Each dimmer shall be clearly labeled with circuit / dimmer number.
    c. Connections and test points shall be accessible through the front of the panels.
    d. The panel shall incorporate a front locking door to cover all user-operable portions of its components.
    e. Panel identification labels shall be bolted or riveted to the front of the panel, and read "DIMMERS (Beginning no.)—(End no.)" Labels shall be engraved lamicoid.
    f. Panels shall include a permanent, clear plastic sleeve for insertion of an 8-1/2” x 11” panel schedule by the Contractor. Sleeves shall be mounted in an accessible location in or on each panel.
2. Electrical Requirements.
    a. Dimmer Panels shall be designed to operate at a voltage of 120/208 volts, 60 Hz, 3-phase 4-wire, with the main busses of each panel sized for maximum full loading of all contained dimmers.

b. Dimmer Panels shall be completely wired internally, and terminals of the proper rating shall be provided for all external connections. Each terminal shall be clearly and permanently marked and numbered.

c. All dimming and control components shall be easily removable for repair or replacement via multi-conductor connectors.

d. Dimmer Panels shall be designed and tested to withstand surges, without impairment to performance, of 6000V, 3000A (equivalent to a near lightning strike).

e. In order to protect control components from a catastrophic failure of voltage isolation at the dimmer module, the Dimmer panel shall incorporate additional isolation between control voltage of all control devices and line voltage of dimmers. Isolation shall be in excess of 2500 volts RMS. This isolation shall be in addition to any isolation provided in each dimmer. If the dimmer panel includes a control signal output receptacle, isolation shall be incorporated to protect the control signal leaving the panel.

3. Thermal requirements.

a. Forced air or convection ventilation shall be provided as required by the Manufacturer to keep the dimmers within safe operating temperature.

b. Each panel shall contain an electronic system to monitor the temperature within the panel. This system shall shut down the panel and activate a warning light should the safe operating temperature of the panel be exceeded.

4. Provide and deliver to Owner at least one spare electronic control module.

5. If necessary to ensure proper air ventilation, provide and install blank filler modules in all unfilled dimmer module spaces. Provide placard on inner face of dimmer panel door, reading: "CAUTION—FILL ALL EMPTY PANEL SLOTS WITH BLANK MODULES. DO NOT OPERATE DIMMERS UNLESS ALL SLOTS ARE FILLED."

6. Install where shown on drawings and as recommended by the Manufacturer.

B. Dimmers.

1. Acoustical requirements.

a. Dimmers shall be equipped with firing circuitry and filtering designed to reduce "filament sing" attributable to rapid electronic switching of the AC waveform.

b. Rise time shall not be less than 500 microseconds measured at 90 degree conduction angle, at the dimmer's full rated load.

2. Electrical requirements.

a. Dimmers shall be designed to operate at a line voltage of 120 volts, 60 Hz.

b. Panels shall include fully magnetic or thermal magnetic circuit breakers to serve as disconnecting devices and to provide branch circuit protection.

c. For panels using plug-in dimmers, each dimmer space shall be completely factory wired, with power and control connections between the Dimmer Module and the Dimmer Panel provided through permanently installed, oversized, self-aligning pin connectors located at the rear of the module.

3. Electronic requirements.

a. Dimmers shall be fully solid state, and shall utilize one of the following technologies:

1) IGBT. A microprocessor and 2 Insulated Gate BiPolar Transistors (IGBTs) which produce a reverse phase control (RPC) output waveform.

2) SCR. Two silicon controlled rectifiers in a back-to-back electrical configuration that provide, at all times, a symmetrical alternating current output.

3) TRIAC. Three terminal semiconductor used for controlling current in forward and reverse directions.

b. All dimmers (except IGBT) shall include integral inductive toroidal filter to reduce the rate of current rise, to isolate the dimmer from the AC line to prevent interaction with other dimmers, and to limit conducted radio frequency interference.

c. Dimmers shall be designed to operate within a normal ambient temperature of 0 degrees C. to 40 degrees C. and in normal relative humidities of 20% to 90% with no adverse effects.

d. The output voltage versus control position (curve) shall be factory adjusted to conform to the IES square law dimming curve.

e. Response time shall not exceed 20msec (or 50 cycles/second).

f. Power efficiency shall exceed 95% at any voltage and at any load.

g. Isolation between the AC line and control circuit shall be in excess of 2500 volts RMS.

PART 3 EXECUTION

1.14 FABRICATION

A. Panels and cabinets shall be welded assemblies of sheet steel or aluminum or bar size angles, channels, and tees or aluminum extrusions forming rigid enclosures to support internal components.

B. Operating elements shall be mechanically safe and electrically "dead."

C. Steel parts and panels shall be cleaned and primed with rust inhibiting primer. Exterior finishes shall be epoxy resin or baked enamel in matte black, or in Manufacturer's standard color where not specified.

D. Internal wiring shall be factory completed, in harnesses, and bound. No loose or randomly routed wires shall be permitted.

E. Wire sizes and insulations shall comply with NEC, UL, and local codes and meet or exceed electronics industry standards.

1.15 PACKING AND SHIPPING

A. Equipment shall be wrapped and sealed in polyethylene and substantially crated for shipment. Crates shall clearly indicate equipment contained, nature of components, and job site allocation.

1.16 INSTALLATION

A. Install all items in conformity with standard trade practices and Manufacturer's recommendations.

B. Consult and coordinate work with trades doing adjoining work.

C. Position all items accurately as indicated in the Drawings, and true to plumb line and level. Maintain maximum headroom and clearance at all points.

D. Where noted on the drawings, the exact location of equipment shall be confirmed in the field with the consultation of the Architect and Lighting Consultant prior to installation.

E. Many equipment locations are determined to provide maximum performance and accessibility for maintenance. When field conditions require equipment to be relocated, it is the Contractor's responsibility to notify the Architect and Lighting Consultant prior to installation.

F. Confirm all of the control wiring with the control system manufacturers.

G. Contractor shall confirm that photocell placement and orientation is consistent with Manufacturer's recommendations. Direct views of electric light sources shall be minimized.

H. For each power and dimmer panel, the Contractor shall provide an 8-1/2" x 11" spreadsheet that identifies the following items for each circuit:

1. Panel Contactor/Dimmer Number
2. Lighting Consultant Contactor/Dimmer Number
3. Manufacturer Control Channel Number
4. Lighting Consultant Control Channel Number
5. Area
6. Load Description
7. Electrician's Wire Number
8. Fixture Type
9. Watts per Fixture
10. Fixture Quantity
11. Total Connected Load
12. Load Type
13. Dim or Non-Dim Circuit

I. If requested by the Specification, the Contractor shall install all of the control station faceplates after the engraving and/or special labeling is completed.

J. Complete thorough cleanup.

1.17 SYSTEM COMMISSIONING

A. Notify the Control System Manufacturer at least 15 business days prior to project completion in order to schedule the system energization and commissioning. The system shall be commissioned by a Manufacturer approved Field Technician.

B. The Manufacturer shall provide the Contractor with a checklist of all work that must be completed prior to the initial Field Technician site visit.

C. The Field Technician shall check all components and installed wiring to ensure compliance with Manufacturer recommendations. The Field Technician shall configure, energize, and operate all system components to ensure operational compliance with this Specification.

D. The Field Technician shall configure and/or verify all Area, Control Channel, Preset, and Daylight Harvesting identification and assignments.

E. The system energization and commissioning shall be completed prior to the lighting control system programming session(s).

F. The Manufacturer shall send one (1) Field Technician to the site for a minimum of three (3) separate, eight (8) hour visits to:

1. Commission the system as noted above.
2. Program the system with the assistance of the Lighting Consultant.
3. Train representatives of the Owner on the operation, use, and maintenance of the system.

1.18 SYSTEM PROGRAMMING AND ADJUSTMENT

A. Notify the Architect and Lighting Consultant at least 10 business days in advance of the project completion date in order to schedule the system programming sessions.

B. Areas, Control Channels, and Presets shall be pre-programmed into the Control System by the Manufacturer. Each of these items shall be capable of being field-modified as needed during the system programming session(s).

C. The daylight harvesting controls, including photocell sensitivity settings and time delays, shall be programmed by the Manufacturer. Confirm the target light level settings for each space with the Lighting Consultant before programming these areas.

D. The final system programming for areas listed in Section 1.1.A shall be supervised by the Lighting Consultant. Programming shall take place after all fixture focusing is complete, filters and other accessories are installed. Programming shall also take place after all window shades are installed and fully functional.

E. Manufacturer shall confirm if daylight harvesting control programming needs to be performed at certain times of day (based on the room/window orientation) and/or during certain sky conditions in order to properly calibrate photocells and program electric light levels.

F. Necessary adjustments and/or modifications shall be made as required by the Manufacturer’s Field Technician.

G. The Contractor shall coordinate with the other trades and the Owner to ensure that programming sessions are scheduled during times when all of the light fixtures can be turned off / on during the entire duration of the sessions, and when the space(s) are unoccupied for other purposes.

H. The Contractor shall provide all ancillary equipment, such as tables and chairs, for the entire duration of the programming sessions.

I. The Contractor shall provide a crew of one (1) person for one (1) afternoon-to-evening programming session.

J. The Contractor shall provide factory certified personnel to assist in the programming of the system for the entire duration of the programming sessions.

K. The Contractor shall, at the consultant's current hourly rates, reimburse the Lighting Consultant for all time and expenses incurred for any additional programming sessions that are required due to:

1. Incomplete or incorrect installation.
2. Insufficient crew.
3. Lack of access to all equipment.
4. Missing, malfunctioning, or incorrect equipment.
5. Equipment and/or obstructions in the space that are between a fixture and its intended aiming point.

L. Upon completion of all installation and programming work, the Contractor shall certify in writing to the Architect that the work is complete and ready for final review.

M. The Owner, Architect, and Lighting Consultant shall conduct the final review within fourteen (14) days of the Contractor's notice of completion. The Manufacturer's Field Technician shall operate the system during the review.

1.19 SYSTEM TRAINING

A. The Manufacturer shall provide qualified personnel at the site to instruct the Owner's staff or representatives in the operation, programming, and maintenance of the system.

B. The Contractor shall schedule the system training session in advance to ensure that the Manufacturer Field Technician will be on-site for training at a time when all of the pertinent representatives of the Owner are available.

C. The instruction session shall be scheduled to last a minimum of four (4) hours. While it may be possible to schedule this instruction session to coincide with the system commissioning and/or programming, such coincidence shall not be assumed.

D. Provide to the Owner video recorded instructions on the operation and maintenance of the system.

1. Information contained in video shall cover all points of operation and maintenance covered in the instruction session with Owner's staff. A video recording of the actual instruction session is acceptable.
2. The video and audio of the recording shall be of sufficient quality that all instructor dialogue contained in the video shall be intelligible and all presented visual information shall be discernable on the recording.
3. Video format shall be electronic media.
4. Provide (2) full copies.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Power distribution panelboards.

B. Overcurrent protective devices for panelboards.

1.02 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260529 - Hangers and Supports for Electrical Systems.

C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

D. Section 260573 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.

E. Section 262200 - Low-Voltage Transformers: Small power centers with integral primary breaker, transformer, and panelboard.

F. Section 262813 - Fuses: Fuses for fusible switches and spare fuse cabinets.

G. Section 264300 - Surge Protective Devices.

1.03 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendments (2022).

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2015.

D. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

E. NEMA ICS 2 - Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2008 (Reaffirmed 2020).

F. NEMA PB 1 - Panelboards; 2011.

G. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 1000V or Less; 2023.

H. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

K. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

L. UL 67 - Panelboards; Current Edition, Including All Revisions.

M. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

N. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

O. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

P. UL 1053 - Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.
   1. Include characteristic trip curves for each type and rating of overcurrent protective device upon request.

C. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
   1. Include dimensioned plan and elevation views of panelboards and adjacent equipment with all required clearances indicated.
   2. Include wiring diagrams showing all factory and field connections.
   3. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
   4. Include documentation of listed series ratings upon request.
   5. Identify mounting conditions required for equipment seismic qualification.

D. Source Quality Control Test Reports: Include reports for tests designated in NEMA PB 1 as routine tests.

E. Field Quality Control Test Reports.

F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

G. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.

H. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Panelboard Keys: Two of each different key.
   3. See Section 262813 for requirements for spare fuses and spare fuse cabinets.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

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

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

A. Maintain ambient temperature within the following limits during and after installation of panelboards:
   1. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. ABB: www.electrification.us.abb.com/#sle.

B. Eaton Corporation: www.eaton.com/#sle.

C. Schneider Electric: www.se.com/#sle.

D. Siemens Industry, Inc: www.new.siemens.com/#sle.

E. Source Limitations: Provide panelboards and associated components produced by same manufacturer as other electrical distribution equipment used for project and obtained from a single supplier.

2.02 PANELBOARDS - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet (2,000 m).
   2. Ambient Temperature:
      a. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).

C. Short Circuit Current Rating:
   1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 260573.
   2. Label equipment utilizing series ratings as required by NFPA 70.

D. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

E. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

F. Bussing: Sized in accordance with UL 67 temperature rise requirements.
   1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
   2. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

G. Conductor Terminations: Suitable for use with the conductors to be installed.

H. Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
      a. Outdoor Locations: Type 3R.
   2. Boxes: Galvanized steel unless otherwise indicated.
      a. Provide wiring gutters sized to accommodate the conductors to be installed.
      b. Provide removable end walls for NEMA Type 1 enclosures.
      c. Provide painted steel boxes for surface-mounted panelboards where indicated, finish to match fronts.
   3. Fronts:
      a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
      b. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.
   4. Lockable Doors: All locks keyed alike unless otherwise indicated.

I. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

J. Surge Protective Devices: Where factory-installed, internally mounted surge protective devices are provided in accordance with Section 264300, list and label panelboards as a complete assembly including surge protective device.

K. Panelboard Contactors: Where panelboard contactors are indicated, provide electrically operated, mechanically held magnetic contactor complying with NEMA ICS 2.
   1. Ampere Rating: Not less than ampere rating of panelboard bus.
   2. Short Circuit Current Rating: Not less than the panelboard short circuit current rating.
   3. Coil Voltage: As required for connection to control system indicated.

L. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.
   1. Where electronic circuit breakers equipped with integral ground fault protection are used, provide separate neutral current sensor where applicable.
   2. Where accessory ground fault sensing and relaying equipment is used, equip companion overcurrent protective devices with ground-fault shunt trips.
      a. Use zero sequence ground fault detection method unless otherwise indicated.
      b. Provide test panel and field-adjustable ground fault pick-up and delay settings.

M. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.

2.03 POWER DISTRIBUTION PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.

B. Conductor Terminations:
   1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
   2. Main and Neutral Lug Type: Mechanical.

C. Bussing:
   1. Phase and Neutral Bus Material: Aluminum.
   2. Ground Bus Material: Aluminum.

D. Circuit Breakers:
   1. Provide bolt-on type or plug-in type secured with locking mechanical restraints.

E. Enclosures:
   1. Provide surface-mounted enclosures unless otherwise indicated.

2. Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
3. Provide clear plastic circuit directory holder mounted on inside of door.

2.04 OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers:
1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
2. Interrupting Capacity:
a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
3. Conductor Terminations:
a. Provide mechanical lugs unless otherwise indicated.
b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
5. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
6. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
7. Provide the following circuit breaker types where indicated:
a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
b. Ground Fault Equipment Protection Circuit Breakers: Designed to trip at 30 mA for protection of equipment.
8. Do not use tandem circuit breakers.
9. Do not use handle ties in lieu of multi-pole circuit breakers.
10. Provide the following features and accessories where indicated or where required to complete installation:
a. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
b. Handle Pad-Lock Provision: For locking circuit breaker handle in OFF position.
c. Auxiliary Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped or been turned off.

2.05 SOURCE QUALITY CONTROL

A. Factory test panelboards according to NEMA PB 1.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive panelboards.

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

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.

D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

E. Provide required support and attachment in accordance with Section 260529.

F. Install panelboards plumb.

G. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches (2000 mm) above the floor or working platform.

H. Provide grounding and bonding in accordance with Section 260526.
   1. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on isolated/insulated ground bus.

I. Install all field-installed branch devices, components, and accessories.

J. Provide fuses complying with Section 262813 for fusible switches as indicated.

K. Set field-adjustable ground fault protection pickup and time delay settings as indicated.

L. Provide filler plates to cover unused spaces in panelboards.

M. Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads where indicated. Also provide for the following:

N. Identify panelboards in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Fusible Switches: Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.

D. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than _____ amperes. Tests listed as optional are not required.

E. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.
   1. Perform inspections and tests listed in NETA ATS, Section 7.14. The insulation-resistance test on control wiring listed as optional is not required.

F. Test GFCI circuit breakers to verify proper operation.

G. Test shunt trips to verify proper operation.

H. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of panelboard fronts.

C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

3.05 CLEANING

A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Wall switches.

B. Wall dimmers.

C. Fan speed controllers.

D. Receptacles.

E. Wall plates and covers.

1.02 RELATED REQUIREMENTS

A. Section 260519 - Low-Voltage Electrical Power Conductors and Cables: Manufactured wiring systems for use with access floor boxes with compatible pre-wired connectors.

B. Section 260526 - Grounding and Bonding for Electrical Systems.

C. Section 260533.16 - Boxes for Electrical Systems.

D. Section 260533.23 - Surface Raceways for Electrical Systems: Surface raceway systems, including multioutlet assemblies.

E. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

F. Section 260583 - Wiring Connections: Cords and plugs for equipment.

1.03 REFERENCE STANDARDS

A. FS W-C-596 - Connector, Electrical, Power, General Specification for; 2014h (Validated 2022).

B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush Mounted (General Specification); 2017g (Validated 2023).

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

D. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

E. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).

F. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2021.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.

I. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.

J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.

K. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

L. UL 1310 - Class 2 Power Units; Current Edition, Including All Revisions.

M. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.

N. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

O. UL 1917 - Solid-State Fan Speed Controls; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
   2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
   3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.

4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
5. Coordinate the core drilling of holes for poke-through assemblies with the work covered under other sections.
6. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

B. Sequencing:
1. Do not install wiring devices until final surface finishes and painting are complete.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.
1. Wall Dimmers: Include derating information for ganged multiple devices.
2. Surge Protection Receptacles: Include surge current rating, voltage protection rating (VPR) for each protection mode, and diagnostics information.

C. Samples: One for each type and color of device and wall plate specified.

D. Certificates for Surge Protection Receptacles: Manufacturer's documentation of listing for compliance with UL 1449.

E. Field Quality Control Test Reports.

F. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

G. Operation and Maintenance Data:
1. Wall Dimmers: Include information on operation and setting of presets.
2. GFCI Receptacles: Include information on status indicators.
3. Surge Protection Receptacles: Include information on status indicators.

H. Project Record Documents: Record actual installed locations of wiring devices.

I. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 016000 - Product Requirements, for additional provisions.
2. Extra Wall Plates: One of each style, size, and finish.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

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

D. Products: Listed, classified, and labeled as suitable for the purpose intended.

E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

PART 2 PRODUCTS

2.01 WIRING DEVICES - GENERAL REQUIREMENTS

A. Provide wiring devices suitable for intended use with ratings adequate for load served.

B. Wiring Device Applications:

1. Receptacles Installed Outdoors or in Damp or Wet Locations: Use weather-resistant GFCI receptacles with weatherproof covers.
2. Provide GFCI protection for:
   a. Receptacles installed within 6 feet (1.8 m) of sinks.
   b. Receptacles installed in kitchens.
3. Single Receptacles Installed on Individual Branch Circuits: Provide receptacle ampere rating equal to branch circuit rating.

C. Wiring Device Finishes:
1. Provide wiring device finishes as described below, unless otherwise indicated.
2. As selected by Architect..

2.02 WALL SWITCHES

A. Manufacturers:
1. Hubbell Incorporated; _____: www.hubbell.com/#sle.
2. Leviton Manufacturing Company, Inc; _____: www.leviton.com/#sle.
3. Pass & Seymour, a brand of Legrand North America, Inc; _____: www.legrand.us/#sle.

B. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

C. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

D. Pilot Light Wall Switches: Industrial specification grade, 20 A, 120/277 V with red illuminated standard toggle type switch actuator and maintained contacts; illuminated with load on; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

2.03 WALL DIMMERS

A. Manufacturers:
1. Leviton Manufacturing Company, Inc; _____: www.leviton.com/#sle.
2. Lutron Electronics Company, Inc; Maestro Series: www.lutron.com/#sle.
3. Pass & Seymour, a brand of Legrand North America, Inc; _____: www.legrand.us/#sle.

B. Wall Dimmers - General Requirements: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1472; types and ratings suitable for load controlled as indicated on the drawings.

C. Control: Slide control type with separate on/off switch.

D. Power Rating, Unless Otherwise Indicated or Required to Control the Load Indicated on the Drawings:
1. Magnetic Low-Voltage: 600 VA.
2. Electronic Low-Voltage: 400 VA.

2.04 FAN SPEED CONTROLLERS

A. Manufacturers:
1. Leviton Manufacturing Company, Inc; _____: www.leviton.com/#sle.
2. Lutron Electronics Company, Inc; Maestro Series: www.lutron.com/#sle.
3. Pass & Seymour, a brand of Legrand North America, Inc; _____: www.legrand.us/#sle.

B. Description: 120 V AC, solid-state, full-range variable speed, slide control type with separate on/off switch, with integral radio frequency interference filtering, fan noise elimination circuitry,

power failure preset memory, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1917.

1. Current Rating: 1.5 A unless otherwise indicated or required to control the load indicated on the drawings.

2.05 RECEPTACLES

A. Manufacturers:
   1. Hubbell Incorporated; _____: www.hubbell.com/#sle.
   2. Leviton Manufacturing Company, Inc; _____: www.leviton.com/#sle.
   3. Lutron Electronics Company, Inc; Designer Style: www.lutron.com/#sle.
   4. Pass & Seymour, a brand of Legrand North America, Inc; _____: www.legrand.us/#sle.

B. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
   1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
   2. NEMA configurations specified are according to NEMA WD 6.

C. Convenience Receptacles:
   1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
   2. Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.
   3. Tamper Resistant and Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.

D. GFCI Receptacles:
   1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
   2. Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
   3. Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations.
   4. Tamper Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type.
   5. Tamper Resistant and Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations.

2.06 WALL PLATES AND COVERS

A. Manufacturers:
   1. Hubbell Incorporated; _____: www.hubbell-wiring.com/#sle.
   2. Intermatic, Inc; _____: www.intermatic.com/#sle.
   3. Leviton Manufacturing Company, Inc; _____: www.leviton.com/#sle.
   4. Lutron Electronics Company, Inc; _____: www.lutron.com/#sle.
   5. Pass & Seymour, a brand of Legrand North America, Inc; _____: www.legrand.us/#sle.

B. Wall Plates: Comply with UL 514D.

1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
2. Size: Standard; _____.
3. Screws: Metal with slotted heads finished to match wall plate finish.
4. Provide screwless wallplates with concealed mounting hardware where indicated.

C. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.

D. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.

E. Weatherproof Receptacle Covers for Damp Locations: Gasketed, cast aluminum, with self-closing hinged cover and corrosion-resistant screws; listed as suitable for use in wet locations with cover closed.

F. Weatherproof Receptacle Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

G. Weatherproof Switch Covers for Wet or Damp Locations: Gasketed, metallic, with externally operable actuating means and corrosion-resistant screws; listed as suitable for use in wet locations.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that wall openings are neatly cut and will be completely covered by wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that floor boxes are adjusted properly.

F. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

G. Verify that core drilled holes for poke-through assemblies are in proper locations.

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

3.02 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of wiring devices provided under this section.
   1. Mounting Heights: Unless otherwise indicated, as follows:
      a. Wall Switches: 48 inches (1200 mm) above finished floor.
      b. Wall Dimmers: 48 inches (1200 mm) above finished floor.
      c. Fan Speed Controllers: 48 inches (1200 mm) above finished floor.
      d. Receptacles: 18 inches (450 mm) above finished floor or 6 inches (150 mm) above counter.
   2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
   3. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.

4. Locate wall switches on strike side of door with edge of wall plate 3 inches (80 mm) from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.

C. Install wiring devices in accordance with manufacturer's instructions.

D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

E. Where required, connect wiring devices using pigtails not less than 6 inches (150 mm) long. Do not connect more than one conductor to wiring device terminals.

F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.

G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

H. Provide GFCI receptacles with integral GFCI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.

I. Unless otherwise indicated, GFCI receptacles may be connected to provide feed-through protection to downstream devices. Label such devices to indicate they are protected by upstream GFCI protection.

J. Install wiring devices plumb and level with mounting yoke held rigidly in place.

K. Install wall switches with OFF position down.

L. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.

M. Do not share neutral conductor on branch circuits utilizing wall dimmers.

N. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.

O. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

P. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

Q. Identify wiring devices in accordance with Section 260553.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect each wiring device for damage and defects.

C. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.

D. Test each receptacle to verify operation and proper polarity.

E. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.

F. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.05 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

B. Adjust presets for wall dimmers according to manufacturer's instructions as directed by Architect.

3.06 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fuses.

B. Spare fuse cabinet.

1.02 RELATED REQUIREMENTS

A. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

B. Section 260573 - Power System Studies: Additional criteria for the selection of protective devices specified in this section.

C. Section 262413 - Switchboards: Fusible switches.

D. Section 262416 - Panelboards: Fusible switches.

1.03 REFERENCE STANDARDS

A. NEMA FU 1 - Low Voltage Cartridge Fuses; 2012.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. UL 248-1 - Low-Voltage Fuses - Part 1: General Requirements; Current Edition, Including All Revisions.

D. UL 248-10 - Low-Voltage Fuses - Part 10: Class L Fuses; Current Edition, Including All Revisions.

E. UL 248-12 - Low-Voltage Fuses - Part 12: Class R Fuses; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate fuse clips furnished in equipment provided under other sections for compatibility with indicated fuses.
      a. Fusible Switches for Switchboards: See Section 262413.
      b. Fusible Switches for Panelboards: See Section 262416.
   2. Coordinate fuse requirements according to manufacturer's recommendations and nameplate data for actual equipment to be installed.
   3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard data sheets including voltage and current ratings, interrupting ratings, time-current curves, and current limitation curves.
   1. Spare Fuse Cabinet: Include dimensions.

C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 016000 - Product Requirements, for additional provisions.
   2. Extra Fuses: One set(s) of three for each type and size installed.
   3. Fuse Pullers: One set(s) compatible with each type and size installed.
   4. Spare Fuse Cabinet Keys: Two.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

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

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Bussmann, a division of Eaton Corporation; _____: www.cooperindustries.com/#sle.

B. Littelfuse, Inc; _____: www.littelfuse.com/#sle.

C. Mersen; _____: ep-us.mersen.com/#sle.

2.02 APPLICATIONS

A. Service Entrance:
   1. Fusible Switches Larger Than 600 Amperes: Class L, time-delay.

B. Feeders:
   1. Fusible Switches up to 600 Amperes: Class RK1, time-delay.
   2. Fusible Switches Larger Than 600 Amperes: Class L, time-delay.

C. General Purpose Branch Circuits: Class RK1, time-delay.

2.03 FUSES

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.

C. Provide fuses of the same type, rating, and manufacturer within the same switch.

D. Comply with UL 248-1.

E. Unless otherwise indicated, provide cartridge type fuses complying with NEMA FU 1, Class and ratings as indicated.

F. Voltage Rating: Suitable for circuit voltage.

G. Class R Fuses: Comply with UL 248-12.

H. Class L Fuses: Comply with UL 248-10.

2.04 SPARE FUSE CABINET

A. Description: Wall-mounted sheet metal cabinet with shelves and hinged door with cylinder lock, suitably sized to store spare fuses and fuse pullers specified.

B. Finish: Manufacturer's standard, factory applied grey finish unless otherwise indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that fuse ratings are consistent with circuit voltage and manufacturer's recommendations and nameplate data for equipment.

B. Verify that mounting surfaces are ready to receive spare fuse cabinet.

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

3.02 INSTALLATION

A. Do not install fuses until circuits are ready to be energized.

B. Install fuses with label oriented such that manufacturer, type, and size are easily read.

C. Install spare fuse cabinet where indicated.

D. Identify spare fuse cabinet in accordance with Section 260553.

END OF SECTION

PART 2 PRODUCTS

1.01 ENCLOSED CIRCUIT BREAKERS

A. Description: Units consisting of molded case circuit breakers individually mounted in enclosures.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet (2,000 m).
   2. Ambient Temperature: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).

D. Short Circuit Current Rating:

E. Conductor Terminations: Suitable for use with the conductors to be installed.

F. Provide solidly bonded equipment ground bus in each enclosed circuit breaker, with a suitable lug for terminating each equipment grounding conductor.

G. Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:

H. Provide externally operable handle with means for locking in the OFF position.

1.02 MOLDED CASE CIRCUIT BREAKERS

A. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.

B. Interrupting Capacity:
   1. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
   2. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.

C. Conductor Terminations:
   1. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

D. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Enclosed safety switches.

1.02 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 260529 - Hangers and Supports for Electrical Systems.

C. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

D. Section 260573 - Power System Studies: Additional criteria for the selection of equipment and associated protective devices specified in this section.

E. Section 262813 - Fuses.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

C. NEMA BS 31047 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013 (Reaffirmed 2023).

D. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

H. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

I. UL 869A - Reference Standard for Service Equipment; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
   2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
   4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.

C. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
   1. Include dimensioned plan and elevation views of enclosed switches and adjacent equipment with all required clearances indicated.
   2. Include wiring diagrams showing all factory and field connections.

3. Identify mounting conditions required for equipment seismic qualification.

D. Field Quality Control Test Reports.

E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

F. Project Record Documents: Record actual locations of enclosed switches.

G. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

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

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

A. Maintain ambient temperature between -22 degrees F (-30 degrees C) and 104 degrees F (40 degrees C) during and after installation of enclosed switches.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. ABB: www.electrification.us.abb.com/#sle.

B. Eaton Corporation: www.eaton.com/#sle.

C. Schneider Electric: www.se.com/#sle.

D. Siemens Industry, Inc: www.new.siemens.com/#sle.

E. Source Limitations: Provide enclosed switches and associated components produced by same manufacturer as other electrical distribution equipment used for project and obtained from single supplier.

2.02 ENCLOSED SAFETY SWITCHES

A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
   1. Altitude: Less than 6,600 feet (2,000 m).
   2. Ambient Temperature: Between -22 degrees F (-30 degrees C) and 104 degrees F (40 degrees C).

D. Horsepower Rating: Suitable for connected load.

E. Voltage Rating: Suitable for circuit voltage.

F. Short Circuit Current Rating:
   1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 260573.
   2. Minimum Ratings:
      a. Switches Protected by Class H Fuses: 10,000 rms symmetrical amperes.
      b. General Duty Single Throw Switches Protected by Class R, Class J, or Class T Fuses: 100,000 rms symmetrical amperes.
      c. Heavy Duty Single Throw Switches Protected by Class R, Class J, Class L, or Class T Fuses: 200,000 rms symmetrical amperes.
      d. Double Throw Switches Protected by Class R, Class J, or Class T Fuses: 100,000 rms symmetrical amperes.

G. Enclosed Safety Switches Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.

H. Provide with switch blade contact position that is visible when the cover is open.

I. Fuse Clips for Fusible Switches: As required to accept fuses indicated.

J. Conductor Terminations: Suitable for use with the conductors to be installed.

K. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.

L. Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.
   1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
      a. Indoor Clean, Dry Locations: Type 1.
      b. Outdoor Locations: Type 3R.

M. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

N. Heavy Duty Switches:
   1. Comply with NEMA BS 31047.
   2. Conductor Terminations:
      a. Lug Material: Copper, suitable for terminating copper conductors only.
   3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive enclosed safety switches.

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

3.02 INSTALLATION

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

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required support and attachment in accordance with Section 260529.

E. Install enclosed switches plumb.

F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches (2000 mm) above the floor or working platform.

G. Provide grounding and bonding in accordance with Section 260526.

H. Provide fuses complying with Section 262813 for fusible switches as indicated or as required by equipment manufacturer's recommendations.

I. Identify enclosed switches in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.

D. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Uninterruptible power supply (UPS) centralized emergency lighting inverters.

1.02 RELATED REQUIREMENTS

A. Section .

B. Section .

C. Section : Identification products and requirements.

D. Section :

1.03 REFERENCE STANDARDS

A. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Corrigendum 2012).

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NECA 416 - Recommended Practice for Installing Energy Storage Systems (ESS); 2026.

D. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

E. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. NFPA 111 - Standard on Stored Electrical Energy Emergency and Standby Power Systems; 2025.

I. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.

J. UL 2043 - Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate compatibility of centralized emergency lighting inverters to be installed with work provided under other sections or by others.
   2. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances required by NFPA 70.
   3. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   4. Coordinate the work with placement of supports, anchors, etc. required for mounting.
   5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Where work of this section involves interruption of power to existing emergency lighting, arrange power interruption with Owner.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product, including ratings, configurations, dimensions, finishes, weights, service condition requirements, and installed features.
   1. Indicate any inverter load restrictions.
   2. Identify mounting conditions required for equipment seismic qualification.

C. Shop Drawings: Indicate dimensions, input/output voltages, power ratings, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, and installed features and accessories.
   1. Include dimensioned plan and elevation views of inverters and adjacent equipment with all required clearances indicated.
   2. Include wiring diagrams showing all factory and field connections.

D. Derating Calculations: Indicate ratings adjusted for applicable service conditions and/or inverter load restrictions.

E. Specimen Warranty: Submit sample of manufacturer's warranty.

F. Evidence of qualifications for manufacturer.

G. Evidence of qualifications for installer.

H. Evidence of qualifications for maintenance contractor (if different entity from installer).

I. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.

J. Field quality control test reports.

K. Maintenance contracts.

1.06 QUALITY ASSURANCE

A. Comply with the following:
   1. NFPA 70 (National Electrical Code).
   2. NFPA 101 (Life Safety Code).

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

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

D. Installer Qualifications: Company with minimum years experience with centralized emergency lighting inverter systems of similar size, type, and complexity.

E. Maintenance Contractor Qualifications:

F. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's instructions to avoid damage to inverter system components, enclosure, and finish.

D. Do not exceed maximum ambient temperature requirements for batteries at any time, which reduces battery service life. Replace batteries exposed to temperatures in excess of manufacturer's requirements.

1.08 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

A. See Section , for additional warranty requirements.

B. Inverter Assemblies: Provide minimum year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

C. Batteries: Provide pro-rata warranty for the duration of rated design life.

PART 2 PRODUCTS

2.01 CENTRALIZED EMERGENCY LIGHTING INVERTERS - GENERAL REQUIREMENTS

A. Provide complete centralized emergency lighting inverter system consisting of all required equipment, conduit, boxes, wiring, supports, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Inverter Assemblies: Manufactured units consisting of inverters, batteries, enclosures, and associated components specifically designed for emergency lighting applications; microprocessor-based utilizing pulse width modulation (PWM) with insulated gate bipolar transistors (IGBT's); listed and labeled as complying with UL 924.
   1. Battery Run Times of 90 Minutes: Listed as complying with UL 924 for "emergency lighting and power equipment".
   2. Battery Run Times Other than 90 Minutes: Listed as complying with UL 924 for "auxiliary lighting and power equipment".

D. Provide inverters and associated components suitable for operation at indicated ratings under the service conditions at the installed location.

E. Increase indicated power ratings as required to accommodate any applicable inverter load restrictions.

F. Inverters Installed in Spaces Used for Environmental Air: Plenum rated; listed and labeled as complying with UL 2043, suitable for use in air-handling spaces.

G. Battery System:
   1. Provide battery capacity as required for achieving battery run time indicated.
   2. Battery Charger: Microprocessor-controlled, temperature compensated; capable of returning supplied battery(s) from fully discharged to fully charged condition within unless otherwise indicated.
   3. Provide automatic low voltage battery disconnect to prevent battery "deep discharge" damage.

H. Enclosures:
   1. Environment Type per NEMA EN 10250:
      a. Indoor Clean, Dry Locations:
   2. Hinged Doors: Lockable, with all locks keyed alike.
   3. Finish:

I. Short Circuit Current Rating: Provide inverter assemblies with listed short circuit current rating not less than 10,000 rms symmetrical amperes.

J. Surge Tolerance: Capable of withstanding characteristic surges according to IEEE C62.41.2, location category B.

K. Automatic Sequence of Operations:
   1. Upon failure or degradation of primary/normal input power, transfer load to battery power.
   2. When primary/normal input power has been restored, retransfer load to primary/normal power and recharge battery.

L. Input Tolerance:
   1. Voltage Range:
   2. Frequency Range:
   3. Total Harmonic Distortion (THD): maximum at full load.

M. Output Requirements:

1. Voltage Regulation:
2. Frequency Range:
3. Total Harmonic Distortion (THD): maximum for linear load.
4. Load Power Factor Capability:

N. Features:
1. Control Functions:
   a. Automatic mode.
   b. Manual Test Mode: Simulates failure of primary/normal source.
   c. Self-testing/self-diagnostics.
2. Status Indications:
   a. Connected to primary/normal source.
   b. Connected to battery power.
   c. Primary/normal source available.
   d. Battery charging.
3. Alarm Indications (Units with Self-Testing/Self-Diagnostics):
   a. General trouble/alarm.

2.02 UNINTERRUPTIBLE POWER SUPPLY (UPS) CENTRALIZED EMERGENCY LIGHTING INVERTERS

A. Manufacturers:
1. Bodine, A Signify North America Brand.
2. Substitutions:
3. Source Limitations: Furnish inverter assemblies and accessories produced by a single manufacturer and obtained from a single supplier.

B. Description: Online, double-conversion type inverters with no transfer time (0 ms) to battery power source upon loss of normal power source; suitable for emergency operation of incandescent, LED, fluorescent, and HID light sources.

C. Uninterruptible Power Supply (UPS) Centralized Emergency Lighting Inverter:
1. Nominal Input/Output Voltage: 120 VAC, 1 -phase, 2 -wire (plus ground) input/output.
2. Nominal Power Rating: 1.1 kVA/kW.
3. Battery Type: Valve-regulated lead acid (VRLA)/sealed lead calcium with 5 year design life.
4. Battery Run Time at Full Output: 90 minutes.
5. Output Circuit Breaker(s):
   a. 1 20 A, normally on, supervised.
6. Features:
   a. manual bypass switch.

D. Products:
1. BODINE #ELI-S-1100.

2.03 SOURCE QUALITY CONTROL

A. Perform production tests on inverter assemblies at factory to verify operation and performance characteristics prior to shipment.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of inverter assemblies are consistent with the indicated requirements.

C. Verify that rough-ins for field connections are in the proper locations.

D. Verify that mounting surfaces are ready to receive inverter assemblies.

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

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install inverter assemblies in accordance with applicable requirements of NECA 416.

C. Install products in accordance with manufacturer's instructions.

D. Arrange equipment to provide minimum clearances and required maintenance access.

E. Provide required support and attachment in accordance with Section .

F. Install inverter assemblies plumb and level. When wall mounted, provide appropriate fire rated structural blocking as required for support.

G. Provide grounding and bonding in accordance with Section .

H. Identify inverter assemblies and associated system wiring in accordance with Section .

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Notify Owner and Architect at least prior to scheduled inspections and tests.

C. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.

D. Provide all equipment, tools, and supplies required to accomplish inspection and testing, including load bank.

E. Prepare and start system in accordance with manufacturer's instructions.

F. Perform acceptance test in accordance with NFPA 111.

G. Inspect and test in accordance with NETA ATS, except Section 4.

H. Perform inspections and tests listed in NETA ATS, Section 7.22.2.

I. Batteries and Charger: Perform inspections and tests listed in NETA ATS, Section 7.18.

J. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

K. Submit detailed reports indicating inspection and testing results and corrective actions taken.

3.04 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.05 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of emergency lighting inverter system to Owner, and correct deficiencies or make adjustments as directed.

B. Training: Train Owner's personnel on operation, adjustment, and maintenance of emergency lighting inverter system.
   1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
   2. Provide minimum of 2 hours of training.
   3. Instructor:
   4. Location:

3.06 PROTECTION

A. Protect installed inverter assemblies from subsequent construction operations.

3.07 MAINTENANCE

A. Provide to Owner a separate maintenance contract for the service and maintenance of emergency lighting inverter system for from date of Substantial Completion; Include a complete

description of preventive maintenance, systematic examination, adjustment, inspection, and testing, with a detailed schedule.

B. Provide trouble call-back service upon notification by Owner:
   1. Provide on-site response within of notification.
   2. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Transfer switches for low-voltage (600 V and less) applications and associated accessories:
   1. Automatic transfer switches.
   2. Includes bypass/isolation transfer switches.

1.02 RELATED REQUIREMENTS

A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 260526 - Grounding and Bonding for Electrical Systems.

C. Section 260529 - Hangers and Supports for Electrical Systems.

D. Section 260548 - Vibration and Seismic Controls for Electrical Systems.

E. Section 260553 - Identification for Electrical Systems: Identification products and requirements.

F. Section 260573 - Power System Studies: Additional criteria for the selection of equipment specified in this section.

G. Section 262816.16 - Enclosed Switches: Safety switches not listed for use as transfer switch equipment.

H. Section 263213 - Engine Generators: For interface with transfer switches.
   1. Includes code requirements applicable to work of this section.
   2. Includes related demonstration and training requirements.

1.03 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

C. NEMA IA 10042-1 - Industrial Control and Systems Part 1: Electromechanical AC Transfer Switch Equipment; 2025.

D. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. NFPA 110 - Standard for Emergency and Standby Power Systems; 2022.

G. UL 1008 - Transfer Switch Equipment; Current Edition, Including All Revisions.

1.04 QUALITY ASSURANCE

A. Comply with the following:
   1. NFPA 70 (National Electrical Code).
   2. NFPA 110 (Standard for Emergency and Standby Power Systems); meet requirements for system Level specified in Section 263213.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
   1. Authorized service facilities located within 200 miles (320 km) of project site.

D. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience with power transfer systems of similar size, type, and complexity; manufacturer's authorized installer.

E. Maintenance Contractor Qualifications: Same entity as installer or different entity with specified qualifications.
   1. Contract maintenance office located within 200 miles (320 km) of project site.

F. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store transfer switches in accordance with manufacturer's instructions.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's instructions to avoid damage to transfer switch components, enclosure, and finish.

1.06 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.07 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Provide minimum one year manufacturer warranty covering repair or replacement due to defective materials or workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Transfer Switches:
   1. Generac Power Systems: www.generac.com/industrial/#sle.
   2. Schneider Electric; ASCO Power Technologies: www.ascopower.com/#sle.

2.02 TRANSFER SWITCHES

A. Provide complete power transfer system consisting of all required equipment, conduit, boxes, wiring, supports, accessories, system programming, etc. as necessary for a complete operating system that provides the functional intent indicated.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Applications:

D. Construction Type: Either "contactor type" (open contact) or "breaker type" (enclosed contact) transfer switches complying with specified requirements are acceptable.

E. Automatic Transfer Switch:
   1. Transfer Switch Type: As indicated on the drawings.
   2. Transition Configuration: As indicated on the drawings.
   3. Voltage: As indicated on the drawings.
   4. Ampere Rating: As indicated on the drawings.
   5. Neutral Configuration: Solid neutral (unswitched), except as indicated.
   6. Load Served: As indicated on the drawings.
   7. Primary Source: As indicated on the drawings.
   8. Alternate Source: As indicated on the drawings.
   9. Products:
      a. Schneider Electric; ASCO 7000 Series Automatic Transfer Switches: www.ascopower.com/#sle.
      b. Schneider Electric; ASCO 300 Series Automatic Transfer Switches: www.ascopower.com/#sle.
      c. Thomson Power Systems TS 870 Series: www.thomsonps.com/#sle.

F. Basis of Design - Automatic Transfer Switch: Schneider Electric; ASCO 7000 Series: www.ascopower.com/#sle.

1. Non-Service-Entrance Switch:
    a. Frame: 30 A to 230 A; open transition only.
    b. Transition Configuration: Open transition.
    c. Neutral Configuration: Solid neutral.
    d. Phase Poles: As indicated on drawings.
    e. Ampere Rating: As indicated on drawings.
    f. Voltage: As indicated on drawings.
    g. Enclosure: As required for installed location.
2. Provide the following:
    a. Extended control power ride-through, 25 seconds.
    b. Manual retransfer selector switch.
    c. Load-shedding circuit; initiated by opening of contact.
    d. Load-shedding circuit; initiated by removal of voltage.
    e. Form C contacts rated at 6A; two sets.
    f. Push-to-test feature for pilot light indicators.
    g. Remote ethernet monitoring.
    h. Transfer switch, bypass, and load power metering interface for building monitoring systems.
    i. Surge protective device, normal source protection; 200 kA per phase, 3-phase, 4-wire, wye.
    j. Surge protective device, emergency source protection; 200 kA per phase, 3-phase, 4-wire, wye.
    k. Surge protective device, load side protection; 200 kA per phase, 3-phase, 4-wire, wye.

G. Comply with NEMA IA 10042-1, and list and label as complying with UL 1008 for the classification of the intended application (e.g. emergency, optional standby).

H. Do not use double throw safety switches or other equipment not specifically designed for power transfer applications and listed as transfer switch equipment.

I. Load Classification: Classified for total system load (any combination of motor, electric discharge lamp, resistive, and tungsten lamp loads with tungsten lamp loads not exceeding 30 percent of the continuous current rating) unless otherwise indicated or required.

J. Switching Methods:
1. Open Transition:
    a. Provide break-before-make transfer without a neutral position that is not connected to either source, and with interlocks to prevent simultaneous connection of the load to both sources.
    b. Where in-phase transfer is indicated, utilize in-phase monitor to initiate transfer when phase angle difference between sources is near zero to limit in-rush currents.
2. Obtain control power for transfer operation from line side of source to which the load is to be transferred.

K. Service Conditions: Provide transfer switches suitable for continuous operation at indicated ratings under the service conditions at the installed location.

L. Enclosures:
1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
    a. Indoor Clean, Dry Locations: Type 1 or Type 12.
2. Finish: Manufacturer's standard unless otherwise indicated.

M. Short Circuit Current Rating:

N. Automatic Transfer Switches:
1. Description: Transfer switches with automatically initiated transfer between sources; electrically operated and mechanically held.

2. Control Functions:
    a. Automatic mode.
    b. Test Mode: Simulates failure of primary/normal source.
    c. Voltage and Frequency Sensing:
        1) Undervoltage sensing for each phase of primary/normal source; adjustable dropout/pickup settings.
        2) Undervoltage sensing for alternate/emergency source; adjustable dropout/pickup settings.
        3) Underfrequency sensing for alternate/emergency source; adjustable dropout/pickup settings.
    d. Outputs:
        1) Contacts for engine start/shutdown (except where direct generator communication interface is provided).
        2) Auxiliary contacts; one set(s) for each switch position.
    e. Adjustable Time Delays:
        1) Engine generator start time delay; delays engine start signal to override momentary primary/normal source failures.
        2) Transfer to alternate/emergency source time delay.
        3) Retransfer to primary/normal source time delay.
        4) Engine generator cooldown time delay; delays engine shutdown following retransfer to primary/normal source to permit generator to run unloaded for cooldown period.
    f. In-Phase Monitor (Open Transition Transfer Switches): Monitors phase angle difference between sources for initiating in-phase transfer.
    g. Engine Exerciser: Provides programmable scheduled exercising of engine generator selectable with or without transfer to load; provides memory retention during power outage.
3. Status Indications:
    a. Connected to alternate/emergency source.
    b. Connected to primary/normal source.
    c. Alternate/emergency source available.
4. Automatic Sequence of Operations:
    a. Upon failure of primary/normal source for a programmable time period (engine generator start time delay), initiate starting of engine generator where applicable.
    b. When alternate/emergency source is available, transfer load to alternate/emergency source after programmable time delay.
    c. When primary/normal source has been restored, retransfer to primary/normal source after a programmable time delay. Bypass time delay if alternate/emergency source fails and primary/normal source is available.
    d. Where applicable, initiate shutdown of engine generator after programmable engine cooldown time delay.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings and configurations of transfer switches are consistent with the indicated requirements.

C. Verify that rough-ins for field connections are in the proper locations.

D. Verify that mounting surfaces are ready to receive transfer switches.

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

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Arrange equipment to provide minimum clearances and required maintenance access.

D. Provide required support and attachment in accordance with Section 260529.

E. Install transfer switches plumb and level.

F. Unless otherwise indicated, mount floor-mounted transfer switches on properly sized 3 inch (80 mm) high concrete pad constructed in accordance with Section 033000.

G. Provide grounding and bonding in accordance with Section 260526.

H. Identify transfer switches and associated system wiring in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Prepare and start system in accordance with manufacturer's instructions.

C. Automatic Transfer Switches:
   1. Inspect and test in accordance with NETA ATS, except Section 4.
   2. Perform inspections and tests listed in NETA ATS, Section 7.22.3. The insulation-resistance tests listed as optional are not required.

D. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

E. Submit detailed reports indicating inspection and testing results and corrective actions taken.

3.04 CLOSEOUT ACTIVITIES

3.05 PROTECTION

A. Protect installed transfer switches from subsequent construction operations.

3.06 MAINTENANCE

A. See Section 017000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

B. Provide to Owner a proposal as an alternate to the base bid, a separate maintenance contract for the service and maintenance of transfer switches for two years from date of Substantial Completion; Include a complete description of preventive maintenance, systematic examination, adjustment, inspection, and testing, with a detailed schedule.

C. Provide trouble call-back service upon notification by Owner:
   1. Provide on-site response within 4 hours of notification.
   2. Include allowance for call-back service during normal working hours at no extra cost to Owner.
   3. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surge protective devices for distribution locations.

B. Surge protective devices for branch panelboard locations.

1.02 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.

B. Section 262413 - Switchboards.

C. Section 262416 - Panelboards.

1.03 ABBREVIATIONS AND ACRONYMS

A. EMI/RFI: Electromagnetic Interference/Radio Frequency Interference.

B. SPD: Surge Protective Device.

1.04 REFERENCE STANDARDS

A. MIL-STD-220 - Method of Insertion Loss Measurement; 2009c (Validated 2019).

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

D. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 1283 - Standard for Electromagnetic Interference Filters; Current Edition, Including All Revisions.

G. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate size and location of overcurrent device compatible with the actual surge protective device and location to be installed. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to ordering equipment.

1.06 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Include detailed component information, voltage, surge current ratings, repetitive surge current capacity, voltage protection rating (VPR) for all protection modes, maximum continuous operating voltage (MCOV), nominal discharge current (I-n), short circuit current rating (SCCR), connection means including any required external overcurrent protection, enclosure ratings, outline and support point dimensions, weight, service condition requirements, and installed features.

1. SPDs with EMI/RFI filter: Include noise attenuation performance.

C. Shop Drawings: Include wiring diagrams showing all factory and field connections with wire and circuit breaker/fuse sizes.

D. Certificates: Manufacturer's documentation of listing for compliance with the following standards:

1. UL 1449.
2. UL 1283 (for Type 2 SPDs).

E. Field Quality Control Test Reports.

F. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

G. Operation and Maintenance Data: Include information on status indicators and recommended maintenance procedures and intervals.

H. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

I. Project Record Documents: Record actual connections and locations of surge protective devices.

1.07 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

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

D. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.08 DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space in accordance with manufacturer's written instructions.

1.09 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.10 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Manufacturer's Warranty: Provide minimum five year warranty covering repair or replacement of surge protective devices showing evidence of failure due to defective materials or workmanship.

C. Exclude surge protective devices from any clause limiting warranty responsibility for acts of nature, including lightning, stated elsewhere.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Field-Installed, Externally Mounted Surge Protective Devices:
   1. ABB: www.electrification.us.abb.com/#sle.
   2. Intermatic, Inc: www.intermatic.com/#sle.
   3. nVent ERICO: www.nvent.com/#sle.
   4. Schneider Electric: www.se.com/#sle.
   5. Surge Suppression, LLC (SSI): www.surgesuppression.com/#sle.

B. Factory-installed, Internally Mounted Surge Protective Devices:
   1. Same as manufacturer of equipment containing surge protective device, to provide complete listed assembly including SPD.

C. Source Limitations: Provide surge protective devices produced by single manufacturer and obtained from single supplier.

2.02 SURGE PROTECTIVE DEVICES - GENERAL REQUIREMENTS

A. Description: Factory-assembled surge protective devices (SPDs) for 60 Hz service; listed, classified, and labeled as suitable for the purpose intended; system voltage as indicated on the drawings.

B. Unless otherwise indicated, provide field-installed, externally-mounted or factory-installed, internally-mouonted SPDs.

C. List and label as complying with UL 1449, Type 1 when connected on line side of service disconnect overcurrent device and Type 1 or 2 when connected on load side of service disconnect overcurrent device.

D. Protected Modes:
   1. Wye Systems: L-N, L-G, N-G, L-L.

E. UL 1449 Voltage Protection Ratings (VPRs):
   1. 208Y/120V System Voltage: Not more than 1,000 V for L-N, L-G, and N-G modes and 1,200 V for L-L mode.
   2. 480Y/277V System Voltage: Not more than 1,500 V for L-N, L-G, and N-G modes and 2,000 V for L-L mode.

F. UL 1449 Maximum Continuous Operating Voltage (MCOV): Not less than 115% of nominal system voltage.

G. Enclosure Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
   1. Indoor clean, dry locations: Type 1.

H. Mounting for Field-installed, Externally Mounted SPDs: Unless otherwise indicated, as specified for the following locations:
   1. Provide surface-mounted SPD where mounted in non-public areas or adjacent to surface-mounted equipment.

I. Equipment Containing Factory-installed, Internally Mounted SPDs: Listed and labeled as a complete assembly including SPD.
   1. Switchboards: See Section 262413.
   2. Panelboards: See Section 262416.

2.03 SURGE PROTECTIVE DEVICES FOR DISTRIBUTION LOCATIONS

A. Distribution locations include SPDs connected to distribution panelboards.

B. Surge Protective Device:
   1. Protection Circuits: Field-replaceable modular.
   2. Surge Current Rating: Not less than 80 kA per mode/160 kA per phase.
   3. UL 1449 Nominal Discharge Current (I-n): 20 kA.
   4. UL 1449 Short Circuit Current Rating (SCCR): Not less than the available fault current at the installed location as indicated on the drawings.
   5. EMI/RFI Filtering: Provide EMI/RFI filter to attenuate electrical noise; listed as complying with UL 1283 for Type 2 SPDs (UL 1283 listing not available for Type 1 SPDs).
      a. Noise Attenuation: Not less than 40 dB at 100 kHz using MIL-STD-220 insertion loss test method.
   6. Diagnostics:
      a. Protection Status Monitoring: Provide indicator lights to report the protection status for each phase.
      b. Alarm Notification: Provide indicator light and audible alarm to report alarm condition. Provide button to manually silence audible alarm.
      c. Surge Counter: Provide surge event counter with manual reset button, surge count retention upon power loss, and six digit LCD display that indicates quantity of surge events.

2.04 SURGE PROTECTIVE DEVICES FOR BRANCH PANELBOARD LOCATIONS

A. Surge Protective Device:
   1. Protection Circuits: Field-replaceable modular.
   2. Surge Current Rating: Not less than 60 kA per mode/120 kA per phase.
   3. UL 1449 Nominal Discharge Current (I-n): 20 kA.
   4. UL 1449 Short Circuit Current Rating (SCCR): Not less than the available fault current at the installed location as indicated on the drawings.

5. EMI/RFI Filtering: Provide EMI/RFI filter to attenuate electrical noise; listed as complying with UL 1283 for Type 2 SPDs (UL 1283 listing not available for Type 1 SPDs).
   a. Noise Attenuation: Not less than 40 dB at 100 kHz using MIL-STD-220 insertion loss test method.
6. Diagnostics:
   a. Protection Status Monitoring: Provide indicator lights to report the protection status for each phase.
   b. Alarm Notification: Provide indicator light and audible alarm to report alarm condition. Provide button to manually silence audible alarm.
   c. Surge Counter: Provide surge event counter with manual reset button, surge count retention upon power loss, and six digit LCD display that indicates quantity of surge events.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the service voltage and configuration marked on the SPD are consistent with the service voltage and configuration at the location to be installed.

C. Verify that electrical equipment is ready to accept connection of the SPD and that installed overcurrent device is consistent with requirements of drawings and manufacturer's instructions.

D. Verify system grounding and bonding is in accordance with Section 260526, including bonding of neutral and ground for service entrance and separately derived systems where applicable. Do not energize SPD until deficiencies have been corrected.

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

3.02 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide conductors with minimum ampacity as indicated on the drawings, as required by NFPA 70, and not less than manufacturer's recommended minimum conductor size.

E. Install conductors between SPD and equipment terminations as short and straight as possible, not exceeding manufacturer's recommended maximum conductor length. Breaker locations may be reasonably rearranged in order to provide leads as short and straight as possible. Twist conductors together to reduce inductance.

F. Do not energize SPD until bonding of neutral and ground for service entrance and separately derived systems is complete in accordance with Section 260526 where applicable. Replace SPDs damaged by improper or missing neutral-ground bond.

G. Disconnect SPD prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPD connected.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Perform inspections and tests listed in NETA ATS Section 7.19.1.

D. Procure services of a qualified manufacturer's representative to observe installation and assist in inspection, testing, and adjusting. Include manufacturer's reports with field quality control submittals.

3.04 CLEANING

A. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE

A. All materials, components, and services necessary to provide a complete system indicated in this Section, as specified herein and shown on related Drawings, including:

1. Verification of dimensions and conditions at the job site to insure proper fitting of the work.
2. Preparation and submission of complete fixture specification submittals and samples for approval prior to fabrication.
3. Shipment of equipment to the job site.
4. Installation and completion in accordance with these Specifications, related Drawings, the Equipment Manufacturer's recommendations, established trade criteria, and all applicable code requirements.
5. Focusing and adjustment of fixtures under the direction of Lighting Consultant.
6. Preparation and submission of complete record drawings.
7. Warranty coverage as required herein.
8. Delivery to Owner of spare lamps and equipment.

1.2 WORK INCLUDED

A. Lighting fixtures, accessories, and lamps, including spare lamps.

B. All materials, accessories, and equipment necessary for a complete lighting fixture installation shall be provided by the Contractor.

C. Integral and remote ballasts, drivers, and/or transformers as required.

The above is for reference only and is not intended to define the limits of the work for a complete installation.

1.3 RELATED WORK IN OTHER SECTIONS

A. General requirements for all electrical work

B. Electrical service

C. Wiring devices for electrical distribution

D. Supporting devices

E. Refurbished Lighting Fixtures

F. Emergency and Exit Lighting

G. Lighting Control Systems

The above is for reference only and is not intended to define the limits of the work for a complete installation.

1.4 SUBMITTALS

A. Pre-Bid.

1. Substitutions.

   a. Requests for fixture and lamp substitutions shall be made no less than ten (10) business days prior to bid due date. No requests for substitutions shall be considered after this time. Requests for substitutions shall be submitted in accordance with the requirements of section 1.4.C.

   b. Specified products are known to be available at the time of construction. Should the Contractor discover that any equipment may be unavailable, it is the Contractor's responsibility to notify the Architect not less than ten (10) business days prior to bid.

   c. Proposed substitute Manufacturers shall have at least ten (10) years' experience in lighting fixture design and fabrication. If requested, the Manufacturer shall submit a representative list of at least 3 projects completed during the above period. Detailed drawings and photographs of the finished products shall be made part of the completed project reference list.

   d. Owner Directed Changes. If the Owner directs the Contractor to submit alternate fixtures for the purpose of reducing the costs, substitutions shall meet or exceed the quality and capabilities of the specified equipment. Such requests for substitutions shall be submitted in accordance with the requirements of section 1.4.C.

   e. If a proposed substitute fails to comply with the Specification requirements, the Contractor shall furnish the acceptable fixture at no additional cost to the Owner, and with no delay to the project.

B. With Bid.

1. All deviations and exceptions from this Specification must be revealed with bid. Deviations and exceptions from the Specification submitted after this time shall not be accepted, whether or not these variations have been formally or informally accepted by the Architect or Lighting Consultant.

2. Manufacturers' catalog numbers listed in the lighting fixture schedule are included to aid in fixture identification. These numbers are subject to periodic change by manufacturers and therefore need to be used in conjunction with the fixture descriptions. Incomplete or obsolete catalog numbers do not indemnify the Contractor from providing equipment as described in the lighting fixture schedule and in this Specification.

3. Fixture Lead Times. Many light fixtures require substantial lead times for delivery. It is the Contractor's responsibility to verify all fixture lead times and to notify the Architect within 2 weeks of contract award if any lead time will not allow them to meet the schedule for project completion.

C. Fixture submittal. The Contractor shall submit shop drawings to the Architect and the Lighting Consultant for review prior to fabrication. Shop drawings prepared solely by a Distributor or Contractor are unacceptable – some Manufacturers will not release orders for submittals they did not prepare. If the Lighting Consultant is required to review submittals prepared by a Distributor / Contractor, and is then required to re-review submittals for the same equipment

prepared by a Manufacturer / Manufacturers Representative, the Contractor shall reimburse the Lighting Consultant, at their current hourly rates, for the duplicate time and expenses incurred.

D. Shop drawings shall contain, at a minimum, the following information:

1. Dimensions, components, weight, and finishes of all equipment and accessories.
2. Indication of fixture mounting conditions and trim type.
3. For continuous linear fixtures, such as coves, submit detailed, dimensioned drawings that indicate lamp, fixture, and ballast/driver configurations, specifications, and locations within their architectural context. Drawings shall be to scale.
4. Complete information on the lamp and/or LED type to be used in each fixture, including manufacturer, current, voltage, wattage, envelope shape and size, envelope type (clear/frosted), beam spread, rated life, correlated color temperature, color rendering index (CRI), color consistency, lumen output, and compatibility with fixtures.
5. Complete photometric performance data as reported by a certified testing laboratory including:
    a. Coefficient of utilization table.
    b. Candlepower data presented in tabular and graphical format.
    c. Zonal lumen summary.
    d. Luminance summary.

    For LED fixtures, provide absolute photometry.
6. Indication of lead time for delivery.
7. Indication by boxed caption of any and all variations from contract Drawings and Specifications, whether or not these variations have been formally or informally accepted by the Architect or Lighting Consultant.
8. Standard catalog cut sheets with insufficient information will not be accepted.
9. Submittals must be prepared by the Manufacturer and/or their local Representative. Submittals prepared by the Distributor or Contractor without the assistance of the Manufacturer and/or their local Representative will not be reviewed or accepted.
10. If requested by the Lighting Consultant, provide samples.

E. Final submittal. As a condition for final approval, the Contractor shall submit to the Architect:

1. Five (5) sets of "As built and approved" drawings showing all systems and components as installed, including all field modifications.
2. “As built and approved” drawings shall include the following information:
    a. Lighting Fixture Schedule.
    b. Approved lighting fixture shop drawings, indicating specifications for all fixtures, lamps, ballasts/transformers, accessories, finishes, manufacturers, catalog numbers, wattages, voltages, and fixture locations.
    c. Manufacturer names and their contact information.
3. Certificates of warranty, as set forth below.

1.5 FINAL REVIEW

A. Upon completion of installation work, the Contractor shall certify in writing that the work is complete and ready for final review.

B. The final review shall be conducted by the Owner, Architect, and Lighting Consultant within fourteen (14) days of the Contractor's notice of completion.

1.6 GENERAL REQUIREMENTS

A. General Conditions of the project contract, work schedules, and site regulations apply to this work.

B. This work shall comply with applicable local codes and the NEC. Fixtures shall carry labels of a Nationally Recognized Testing Laboratory (NRTL), such as UL or ETL.

C. Warranty.

1. The Contractor shall unconditionally warrant all equipment and systems provided under this Section to be free from defects in materials and workmanship for a period of at least twelve (12) months from the date of final acceptance of all work of this Section. Replacement of faulty materials and the cost of labor required for the replacement shall be the responsibility of the Contractor. Lamps and normal wear and tear are exempted.

2. Warranty service shall be performed by personnel in the employ of the Contractor and shall not be sub-contracted or assigned to another company, service, or individual unless the Owner has approved such assignment in writing, in which event the Contractor shall nevertheless be responsible to the Owner for such work.

3. LED Fixtures.

a. Fixture Manufacturer shall provide a minimum 5-year warranty for all components.

b. Replacement components shall match all of the performance characteristics of the originally-installed fixtures and LEDs.

c. Replacement components shall be fully compatible with the original components.

D. State-of-the-art Assurance.

1. All products specified shall be the Manufacturer’s most recent iteration and most recent product. No products shall be accepted if they have been discontinued or superseded at the time of shipment. Should the Manufacturer develop products of comparable function above and beyond the specification of the listed product, the Contractor shall notify the Architect and the Lighting Consultant of any developments to the specified products and shall note any change in the requirements of building infrastructure(s) to support the developments. The Architect and Lighting Consultant shall then determine whether upgraded products shall be accepted.

PART 2 PRODUCTS

1.7 GENERAL

A. Refer to the Lighting Fixture Schedule in the Drawings for fixture and lamp specifications.

B. Verify ceiling type, ceiling thickness, fixture mounting conditions, clearances, and structural suspension system prior to the procurement of fixtures.

C. Provide sufficient clearance surrounding lighting fixtures to meet manufacturers' minimum recommendations and to ensure that fixture operating temperature remains within acceptable limits.

D. Provide mounting hardware as required for a complete installation.

E. Verify the ability to orient adjustable and directional fixtures as indicated on the drawings prior to the procurement of fixtures.

F. Notify the Architect immediately of any conflicts between the specified equipment and the actual mounting conditions.

G. Verify if any recessed fixtures require Plenum or IC ratings. Contractor shall notify the Architect prior to purchasing any fixture that may be in violation of any pertinent building codes, including Plenum or IC requirements.

H. Materials shall be new and free from defects that in any manner may impair their character, appearance, strength, durability, and function. Materials shall be effectively protected from any damage from the time of fabrication until final acceptance of the work.

I. Provide light fixtures complete with lamps, ballasts/drivers/transformers, and accessories as required, as shown on the Drawings, in the Lighting Fixture Schedule, and as required by this Specification.

J. Fixtures shall carry labels of a Nationally Recognized Testing Laboratory (NRTL), such as UL or ETL. Such labels shall be permanently attached in a conspicuous location that does not affect fixture performance or aesthetics.

K. Fixtures shall carry labels identifying the Manufacturer name and contact information, model number, and serial number. Such labels shall be permanently attached in a conspicuous location that does not affect fixture performance or aesthetics.

L. For remote drivers, the Contractor shall verify the maximum allowable distance between the drivers and LED assemblies.

1.8 LAMPS

A. Acceptable manufacturers shall be as specified in the Lighting Fixture Schedule. Requests for lamp substitutions shall be in accordance with the "Submittals" section of this Specification.

B. Provide lamps that meet all of the specified characteristics such as type, base, envelope, wattage, manufacturer, color temperature, color rendering index, lamp life, L.C.L. (light center length), and M.O.L. (maximum overall length).

C. If multiple fixture types have the same lamp specified, all lamps shall be of the same manufacturer, unless noted otherwise in the Lighting Fixture Schedule.

D. Incandescent, tungsten (quartz) halogen, and LED retrofit lamps shall be 120V unless noted otherwise in the Lighting Fixture Schedule.

E. LED Retrofit Lamps.

1. LED retrofit lamps shall have:
    a. Labels of a Nationally Recognized Testing Laboratory (NRTL), such as UL or ETL.
    b. Correlated color temperature (CCT) as specified in the Lighting Fixture Schedule.
    c. Color consistency of each specified fixture type shall be within 3 MacAdam ellipses or better, centered on the black body curve, through L70 and entire dimming range.
    d. Minimum color rendering index (CRI) of 80 or as specified in the Lighting Fixture Schedule.
    e. Rated life, typically L70, is defined as the point in time when the LED lumen output is 70% of the initial lumen output, as tested in accordance with IES LM-80. Minimum rated life at L70 (or greater, i.e. L80, L85, etc.) shall be:
        1) A, MR, and R/BR/PAR LED lamps: 25,000 hours or greater
        2) All other LED lamp types: 15,000 hours or greater
    f. No power consumption in the “off” state.
    g. Smooth, continuous dimming throughout the specified dimming range without flicker or “stepping”, if specified as dimmable.
    h. No audible noise when energized at “full”, or when dimmed (if applicable). Meet or exceed sound class rating of A.
2. Confirm with manufacturers that LED retrofit lamps are compatible with fixtures and associated equipment.
3. LED retrofit lamps shall comply with the LED testing procedures outlined in “LED Fixtures” Section of this Specification.
4. Provide samples if requested by the Lighting Consultant.
5. Contractor shall purchase all specified lamps, including spare lamps, from the same batch to ensure consistent performance.

F. Provide spare lamps, including LED modules (where applicable), for all fixture types. Quantities shall be equal to not less than 10% of the fixture quantity of each type, but in no case less than two (2) lamps per fixture type. Deliver to Owner in clearly labeled cartons.

1.9 FIXTURES - GENERAL

A. Acceptable manufacturers shall be as specified in the Lighting Fixture Schedule. Requests for fixture substitutions shall be in accordance with section 1.4, “Submittals.”

B. Housings shall be so constructed that all electrical components are easily accessible and replaceable without removing fixtures from the mountings or disassembling adjacent construction.

C. Fixtures shall be completely wired at the factory.

D. Fixtures shall be designed to prevent light leaks from around lenses, trim rings and/or frames.

E. Castings shall be free of sand pits, blemishes, scales, and rust, and shall be smoothly finished. Tolerance shall be provided for any shrinkage of the metal castings so that the finished castings will accurately fit in their designated locations.

F. Welds shall be continuous unless specifically approved otherwise by Architect and Lighting Consultant. Welds shall be located and completed so as to present a smooth and unbroken appearance on visual examination of the fixture housing.

G. Socket based fixtures shall be wired with heat resistant wire as required.

H. Final electrical connections for outdoor fixtures shall utilize silicone-filled wire nuts.

I. Recessed fixtures installed in inaccessible ceilings shall be NRTL listed for through wiring with the junction box accessible from the fixture opening.

J. Recessed fixtures shall be equipped with thermal protection devices.

K. Pendant hardware and method of construction shall ensure that fixtures are prevented from rotating from their correct orientation.

L. Mechanically adjustable lighting fixtures shall have reliable heavy-duty locking devices for tilt and rotation.

M. Fixtures that have lamps with oval-shaped beams shall contain locking devices to maintain lamp orientation during lamp replacement or fixture maintenance.

N. Louver, hood and lens devices shall be removable, but positively engaged to the fixture so that they will not drop away during fixture maintenance.

1.10 OPTICAL SYSTEMS

A. Optical systems may use one or more of the following components:

1. Lenses
2. Reflectors
3. Louvers
4. Hoods / snoots

B. Optical systems shall:

1. Produce a smooth distribution of light, absent of striations, color separation, or other aberrations
2. Not alter the color of the light source
3. Be UV stable
4. Be positively retained within the fixture
5. Be resistant to vibration
6. Produce cutoff angles as specified
7. Interchangeable in the field (where specified)
8. Not reduce the rated life of the light source due to heat or other factors

C. For fixtures that require the optical system to be removed to accommodate the fixture installation, the optical system design shall ensure it can only be re-installed in the correct orientation and position.

1.11 LED (LIGHTING EMITTING DIODE) FIXTURES

A. LED fixtures may be configured in one of several ways:

1. Fixtures that utilize field-replaceable LEDs
2. Fixtures that do not utilize field-replaceable LEDs
3. Fixtures that utilize LED retrofit lamps (refer to “Lamps” section of this Specification for additional information)

B. An LED fixture may include the following components:

1. LED
2. Thermal Management System
3. Optical System
4. Driver and/or Power Supply
5. Connectors
6. Control Interface

C. LEDs and fixture components shall be listed by a Nationally Recognized Testing Laboratory (NRTL) such as UL or ETL.

D. LEDs.

1. White light LEDs.
   a. White LED fixtures shall utilize one of the following systems:
      1) Chip-on-board – phosphor is applied directly to LED chip(s)
      2) Remote phosphor – air gap between LED chip(s) and phosphor
   b. Static White LEDs.
      1) Static white LEDs have a fixed correlated color temperature regardless of output.
      2) Correlated color temperature (CCT) as specified in the Lighting Fixture Schedule. Specified CCT shall indicate delivered light from fixture, including any CCT shifting from LED coatings, lenses, etc.
      3) Color consistency of each specified fixture type shall be within 3 MacAdam ellipses or better, centered on the black body curve, through L70 and entire dimming range.
      4) Color rendering index (CRI) greater than or equal to 80 through L70, or as specified in the Lighting Fixture Schedule.
   c. Tunable White LEDs.
      1) Types.
         a) Dynamic white. Correlated color temperature can be adjusted anywhere along the Planckian locus within the specified range, independent of the output.
         b) Dim to warm. Correlated color temperature becomes lower/warmer as output is reduced to simulate the look of halogen dimming.

2) Correlated color temperature (CCT) range as specified in the Lighting Fixture Schedule. Specified CCT shall indicate delivered light from fixture, including any CCT shifting from LED coatings, lenses, etc.

3) Color consistency of each specified fixture type shall be within 3 MacAdam ellipses or better, centered on the black body curve, through L70 and entire CCT and dimming range.

4) Color rendering index (CRI) greater than or equal to 80 through the entire specified CCT range and L70, or as specified in the Lighting Fixture Schedule.

d. Fixture manufacturer shall keep a record of the LED chip manufacturer, bin, production date, CCT, lumen output, mA rating, power consumption, and LM-80 data for all products they provide to help ensure that future replacements are consistent with the original LEDs used.

2. Colored Light LEDs.

a. Static Color LEDs.

1) Static color LEDs shall have fixed color regardless of output.

2) Color / dominant wavelength (nm) as specified in the Lighting Fixture Schedule. Specified LED colors shall indicate delivered light from fixture, including any color / dominant wavelength shifting from LED coatings, lenses, etc.

3) Color consistency of each specified fixture type shall be within 3 MacAdam ellipses or better, through L70 and entire dimming range.

b. Color-Changing LEDs.

1) Color-changing LEDs shall use various static color LEDs that are dimmed and mixed together to create a dynamic range of colored light.

2) Configurations:

a) RGB – red, green, and blue LEDs

b) RGBW – red, green, blue, and white LEDs

c) RGBA – red, green, blue, and amber LEDs

d) RGBWA – red, green, blue, white, and amber LEDs

e) Other LED combinations as specified in the Lighting Fixture Schedule

3) White LEDs in color-changing systems shall meet the requirements of the “White Lights LEDs” section above.

3. Construct fixtures so as to allow the LEDs to be easily accessed and replaced without being removed from the mountings or disassembling adjacent construction.

4. For fixtures with replaceable components, Manufacturer shall offer replacement LED components that match all of the characteristics of the components being replaced. Replacement components shall not void the fixture NRTL listing.

5. For fixtures without replaceable components, Manufacturer shall offer replacement LED fixture that matches all of the characteristics of the fixture being replaced.

E. LED Thermal Management Systems.

1. Fixture and remote devices, if any, shall not exceed component manufacturer’s recommended maximum operating temperatures.

2. Confirm that specified orientation of fixture and mounting methods are approved by the fixture Manufacturer.
3. Provide supplemental thermal management devices / accessories as recommended by manufacturer.
4. Fixture manufacturer shall confirm that specified accessories and finishes do not compromise thermal management.
5. Fixtures shall not rely upon powered, mechanical components, such as fans or SynJet devices, for cooling. Fixtures shall utilize passive cooling methods. Do not substitute specified passive cooling products with active cooling products.
6. Cooling devices shall have a sound class rating of A.

F. LED Optical Systems.

1. Refer to the “Optical Systems” section of this Specification for additional information.

G. LED Drivers and/or Power Supplies.

1. The Driver and Power Supply may be separate components or combined within a single enclosure.
2. The Driver and Power Supply shall manage the power and control the current flow to LEDs.
3. Performance Requirements:
    a. Power output of the Driver and/or Power Supply shall operate LEDs within the specifications provided by the LED chip manufacturer:
        1) AC or DC current to LEDs as required.
        2) Line voltage or low voltage to LEDs as required.
        3) Constant current or constant voltage to LEDs as required
    b. Operate from a 60Hz source of 120 or 277 volts as specified in the Electrical Drawings.
    c. Minimum input power factor of 90%.
    d. Maximum total harmonic distortion (THD) of 20%.
    e. Minimum efficiency of 70% at full rated load of the driver.
    f. Short circuit and overload protection.
    g. Maximum inrush current shall not exceed values established by NEMA standard 410.
    h. Minimum starting temperature of 32°F / 0°C for indoor applications, and -4°F / -20°C for outdoor applications.
    i. Meet or exceed a sound class rating of A.
    j. Comply with the requirements of the Federal Communications Commission (FCC) rules and regulations.
4. Dimming Requirements:
    a. Meet or exceed the dimming range specified in the Lighting Fixture Schedule.
    b. Dim LEDs smoothly and continuously throughout the specified dimming range without flicker or “stepping.”

1) Minimum frequency of 60 Hz

2) Maximum modulation percentage of 0.08 multiplied by the frequency

c. Drivers and/or Power Supplies shall be controlled using one of the following control protocols:

1) Line voltage dimming:

a) Two-wire forward phase

b) Two-wire reverse phase

c) Three-wire forward phase

2) 0-10V

3) DMX

4) DALI

5) Wireless

d. Drivers and/or Power Supplies shall dim LEDs using one of the following methods:

1) Pulse width modulation (PWM)

2) Constant current reduction

3) Constant amperage reduction

4) Hybrid

e. Allow the light output to be maintained at the lowest control setting (prior to off) without dropping out.

f. Refer to Specification Section 26 0933 for additional information regarding control requirements.

5. Mounting.

a. Integral to fixture.

1) Driver shall be installed within or attached to housing by the fixture Manufacturer.

2) Manufacturer shall ensure that driver has sufficient heat dissipation.

3) Driver shall be accessible and removable without the use of tools.

4) Driver shall be field-replaceable without voiding NRTL listing.

b. Remote from fixture.

1) Driver shall be installed where located in the Drawings. Install in accessible locations with sufficient heat dissipation.

2) Do not exceed manufacturer's maximum recommended distance between the LED and driver.

3) Provide plenum rated enclosure where required.

4) Provide wet-listed enclosure where required.

H. LED Interconnected Fixtures.

1. Applies to LED systems where multiple fixtures or segments are daisy-chained together in the field (cove uplights, task lights, tape light, etc.).

2. Fixtures or segments shall be mounted side-by-side for a consistent LED diode pitch (spacing).
3. Provide manufacturer's recommended gap between fixtures to accommodate thermal expansion and accessory installation.
4. Cables shall:
    a. Have NRTL listing that is clearly marked on the cable
    b. Have plenum rating, where required
    c. Have NRTL and/or IP rating that matches fixture rating, where applicable
    d. Leader cables:
        1) Located at the start of a fixture run to connect fixtures back to power supply and/or power source.
        2) Where required, provide an approved wiring compartment in lieu of a leader cable.
    e. Interconnecting cables:
        1) Located in-between fixtures or segments within a single run.
        2) Where required, provide fixtures with permanently-attached cables or conduit connections.
    f. Be installed within conduit, where required
    g. Be secured to the mounting surface and concealed from view
    h. Be provided and assembled by fixture manufacturer
    i. Comply with applicable codes
    j. Finish per Architect
5. Connectors shall:
    a. Have NRTL listing that is clearly marked on the connector
    b. Have plenum rating, where required
    c. Have NRTL and/or IP rating that matches fixture rating, where applicable
    d. Have locking-type assembly, when available
    e. Be provided and assembled by fixture manufacturer. Connectors shall not be soldered on-site
    f. Comply with applicable codes
    g. Finish per Architect

I. LED Control Interfaces.

1. LED Control Interfaces convert control protocols so that the lighting control system and LED drivers can communicate with one another.
2. Utilize one of the following protocols:
    a. 0-10V
    b. DMX
    c. DALI
    d. Wireless

Coordinate with the lighting control system manufacturer to ensure that fixtures and controls are compatible.

3. LED Control Interfaces may communicate with individual or multiple fixtures.
4. Mounting.
   a. Integral to fixture.
      1) Interface shall be installed within or attached to housing by the fixture Manufacturer.
      2) Manufacturer shall ensure that interface has sufficient heat dissipation.
      3) Interface shall be accessible and removable without the use of tools.
   b. Remote from fixture.
      1) Interface shall be installed where located in the Drawings. Install in accessible locations that provide sufficient heat dissipation.
      2) Do not exceed manufacturer's maximum recommended distance between the LED and interface.
      3) Provide plenum and/or wet-listed enclosures where required.

J. LED End-of-Life.
1. LED fixtures shall have a minimum rated life of 50,000 hours at L70, L80, or greater. L70 is the point in time when the LED output is 70% of the initial lumen output, as tested in accordance with IES LM-80.
2. System shall automatically notify occupants when LEDs reach their rated life (L70) through one of the following methods:
   a. Timer function within fixture driver:
      1) Driver sends a signal to the lighting control system.
      2) Contrasting color indicator turns on within fixture and remains on until the LED has been replaced.
   b. Timer function within lighting control system:
      1) Lighting Control System notifies user that LEDs need to be replaced.

K. LED Manufacturers.
1. The following LED manufacturers shall be acceptable assuming they are capable of meeting or exceeding the specifications in this Section and the Lighting Fixture Schedule:
   a. Bridgelux
   b. Citizen
   c. Cree
   d. General Electric
   e. Lumenetix
   f. Lumileds
   g. Nichia
   h. Osram Sylvania
   i. Philips

j. Samsung

k. Soraa

l. Toshiba

m. Xicato

Other manufacturers may be considered with the prior review of the Lighting Consultant. Manufacturers seeking review must contact the Lighting Consultant no later than ten (10) days prior to bid date.

2. The following LED Driver and/or Power Supply manufacturers shall be acceptable assuming they are capable of meeting or exceeding the specifications in this Section and the Lighting Fixture Schedule:

a. EldoLED

b. General Electric

c. Lutron

d. Osram Sylvania

e. Philips Advance

Other manufacturers may be considered with the prior review of the Lighting Consultant. Manufacturers seeking review must contact the Lighting Consultant no later than ten (10) days prior to bid date.

L. LED Testing.

1. Fixtures and components shall be manufactured and tested based on Approved Methods as stated in the following standards:

a. IES LM-79 - “Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products.”

b. IES LM-80 – “Approved Method for Measuring Lumen Maintenance of LED Light Sources.”

c. IES TM-21 – “Lumen Depreciation Lifetime Estimation Method for LED Light Sources.”

2. Manufacturers shall provide this testing data if requested by the Lighting Consultant.

1.12 ELECTRICAL COMPONENTS

A. Electrical components shall carry labels of a Nationally Recognized Testing Laboratory (NRTL), such as UL or ETL., shall be of substantial construction, and shall meet or exceed industry standards and trade practices.

B. Lampholders shall be suitable for outdoor applications when properly enclosed in a fixture that is NRTL listed for wet location.

C. Lead wires and lampholders shall have a minimum temperature rating of 200°C. Lead wires shall be rated at or above the lampholder rating.

D. Internal Fixture Wiring.

1. Wiring methods shall meet or exceed the requirements as established by NEC and approved standards organizations.

2. Wiring shall maintain earth ground to all components. Conductors shall not be smaller than 18-gauge.
3. Electrical connection shall be through mounting brackets as shown in the Drawings.
4. Normal and Emergency conductors and all associated electrical components shall be isolated from each other when housed in the same fixture.
5. Fixtures that are wired with Normal and Emergency power shall be fed separately. Manufacturer shall keep all wiring and associated electrical components in separate compartments and raceways. Compartments shall be separated with a barrier as recommended by the Manufacturer.
6. Fixture voltage(s) per the specifications in the Electrical Drawings.
7. Circuiting as shown in the Drawings. All circuits shall be 2-wire, with no common neutrals. For fixtures with multiple circuits, Manufacturer shall clearly label conductors with circuit numbers.
8. Lead wires shall be provided 12 in. in length beyond fixture entry point.

1.13 MOUNTING SYSTEMS

A. The following requirements refer to canopies, mounting plates, mounting arms, stems, chains, cables, and associated hardware required to support the fixtures.

B. Manufacturer shall provide all required mounting system components as part of the work of this Section, including fasteners, safety cables, anchors, etc.

C. Mounting system components and associated hardware shall be designed and fabricated to support entire weight of fixture and components.

D. Suspension mechanisms shall be designed and engineered by the Manufacturer to assure that the fixture remains level and in balance.

E. If indicated in the Drawings, Manufacturer shall coordinate suspension mechanism with the specified winch system.

F. Safety cables shall be concealed within fixture stems.

G. Chains shall be designed to prevent spinning of fixture and maintain fixture orientation.

H. Suspension and safety cables shall be selected using a minimum safety factor of 3:1.

I. Suspension chains shall be welded link and shall be selected using a minimum safety factor of 3:1.

J. Wherever possible, Manufacturer shall minimize the appearance of exposed fasteners.

K. Finish(es) per Architect.

1.14 ENCLOSURES

A. Enclosures shall be categorized as follows:

1. Fixture Enclosures. Enclosures shall be designed and fabricated to house and protect fixtures that are rated for dry or damp location use.

2. Ballast / Driver / Transformer Enclosures. Enclosures shall be designed and fabricated to house and protect ballasts/drivers/transformers that are rated for dry or damp location use.

B. Enclosures shall be completely sealed and rated for outdoor use.

C. Enclosures shall be rated NEMA Type 3 or higher.

D. Enclosure finish(es) shall be as specified in the Lighting Fixture Schedule.

E. Enclosure locations and mounting orientations shall be as specified in the Drawings.

F. Electrical feed locations shall be properly sealed to prevent moisture from entering the enclosures.

G. Enclosures and hardware shall be made of UV-stabilized materials that are resistant to corrosion.

H. Enclosures and hardware shall be designed for long-term, permanent exterior installations.

I. Fixture Enclosures.

1. Enclosures shall be designed for use with the specified lighting fixture. Enclosures shall be approved by fixture Manufacturer for use with the specified lighting fixture.

2. Enclosures shall be designed to allow sufficient air circulation around fixture for heat dissipation. Enclosure shall include integral fan, if required, to maintain fixture's recommended maximum operating temperature.

3. Enclosures shall allow for easy access to the fixture for re-lamping and maintenance without disturbing the aim and focus of the fixture.

4. Enclosures shall not obstruct the lighting distribution of the specified lighting fixture.

5. Enclosures shall be designed to prevent light leaks.

6. Enclosures shall be capable of accommodating accessories specified in the Lighting Fixture Schedule.

7. Adjustable enclosures shall have reliable heavy-duty locking devices for tilt and rotation.

J. Ballast / Driver / Transformer Enclosures.

1. Enclosures shall be designed for use with the specified ballast / driver / transformer. Enclosures shall be approved by ballast /driver / transformer Manufacturer for use with the specified product.

2. Enclosures shall be designed to allow for proper heat dissipation from ballast /driver / transformer.

3. Enclosures shall allow for easy access to the ballast / driver / transformer for maintenance.

PART 2 - EXECUTION

2.1 FABRICATION

A. Operating elements shall be mechanically safe and electrically "dead."

B. Internal wiring shall be factory completed. All wiring shall be in harnesses and bound. No loose or randomly routed wires shall be permitted.

C. Wire sizes and insulations shall comply with NEC, UL, and local codes and meet or exceed electronics industry standards.

2.2 PACKING AND SHIPPING

A. Equipment shall be wrapped, sealed, and substantially crated for shipment. Crates shall clearly indicate equipment contained.

B. Deliver and store materials in Manufacturer’s original packaging labeled to show project name, project fixture type, Manufacturer name, and model number.

C. Store materials in protected, dry, elevated location and in accordance with Manufacturer’s instructions. Do not open packaging or remove labels until time for installation.

2.3 INSTALLATION

A. Install items in conformity with standard trade practices and Manufacturer's recommendations. Position all items accurately as indicated in the Drawings, and true to plumb line and level. Maintain maximum headroom and clearance at all points.

B. Consult and coordinate work with trades doing adjoining work.

C. Mount all fixtures so as to maintain the fixtures' full range of motion.

D. Where noted on the drawings, the exact location of fixtures shall be confirmed in the field with the consultation of the Lighting Designer and the Architect prior to installation.

E. Many fixture locations are determined to provide maximum performance and accessibility for maintenance. When field conditions require fixtures to be relocated, it is the Contractor’s responsibility to notify the Architect and Lighting Consultant prior to installation.

F. Align continuous linear fixtures with one another to ensure precise alignment and consistent appearance.

G. Support surface-mounted fixtures directly from the building structure.

H. Provide temporary lighting, power, and wiring for the performance of all trades, for the entire period of construction, and remove all temporary wiring at the completion of construction. Temporary lighting hung from the existing chandelier positions shall have a similar scale, lumen output, and color temperature relative to the original fixtures. Review proposed temporary lighting selections with Architect prior to purchasing.

I. Fixtures that are part of the work of this Section shall not be utilized for job site illumination during construction. All lamps shall be substantially new upon completion.

J. Protect lighting equipment from paint, dirt, and debris during construction.

K. Installation and care of LED fixtures:

1. LED components (such as LED boards, heat sinks, active cooling devices, drivers, etc.) are particularly susceptible to permanent degradation and/or damage from debris and dust.
2. LED components that are not sealed or enclosed by a lens shall be installed only after all dust-generating activities and preliminary cleaning have been completed.
3. Failure to properly protect LED components from construction dust and debris could void the Manufacturer's warranty.
4. Contractor shall replace any LED components and/or fixtures damaged by construction dust and debris at their cost.

L. Upon completion of the Work, fixtures shall be cleaned and be free of fingerprints, dust, or any debris. Refer to Manufacturer's instructions for proper cleaning methods and materials.

2.4 FIXTURE FOCUSING AND ADJUSTMENT

A. Notify the Architect and Lighting Consultant at least 10 business days in advance of the project completion date in order to schedule the fixture focusing sessions.

B. The final focusing, aiming, and adjustment of fixtures in this Section shall be supervised by the Lighting Consultant.

C. The Contractor shall coordinate with the other trades and the Owner to ensure that fixtures specified by the Lighting Consultant are accessible.

D. The Contractor shall coordinate with the other trades and the Owner to ensure that focusing sessions are scheduled during times when all of the light fixtures can be turned off / on during the entire duration of the sessions. Individual circuits shall have the ability to be turned on / off independently of the other lighting circuits.

E. The Contractor shall provide means of accessing all lighting fixtures such as ladders, lifts, and scaffolding; such means of access shall not obstruct the line of sight between any fixture and its intended aiming point. Provide two (2) means of access for each fixture mounting height in order to have two focusing teams working at the same time.

F. The Contractor shall provide a crew of two (2) persons, including the job supervisor, for one (1) six-hour evening focusing session.

G. The Contractor shall, at the consultant's current hourly rates, reimburse the Lighting Consultant for all time and expenses incurred for any additional focusing sessions that are required due to:

1. Incomplete or incorrect installation.
2. Insufficient crew.
3. Lack of access to all fixtures.
4. Missing or malfunctioning lifts, ladders, and/or scaffolding for accessing fixtures.
5. Insufficient or incorrect tools to open, adjust, and lock fixtures.
6. Missing, malfunctioning, or incorrect fixtures.
7. Malfunctioning, or incorrect ballasts / drivers / transformers.

8. Missing or incorrect fixture accessories.
9. Missing, malfunctioning, or incorrect lamps. (Note: lamps must be exactly as specified, including characteristics such as color temperature, beam spread, wattage, voltage, etc.).
10. Equipment and/or obstructions between a fixture and its intended aiming point.
11. Lack of spare lamps.
12. Incomplete or unfinished walls, ceilings, or other architectural elements.
13. Missing or incomplete exhibits, artwork, furnishings, room finishes, and/or other objects that are to be illuminated.

H. If any fixtures are moved out of adjustment or position after they have been focused, the Lighting Consultant shall be reimbursed, at their current hourly rates, for all time and expenses incurred for any additional focusing sessions that are required.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE

A. All materials, components, and services necessary to provide a complete system indicated in this Section, as specified herein and shown on related Drawings, including:

1. Verification of dimensions and conditions at the job site to insure proper fitting of the work.
2. Preparation and submission of complete fixture specification submittals and samples for approval prior to fabrication.
3. Shipment of equipment to the job site.
4. Installation and completion in accordance with these Specifications, related Drawings, the Equipment Manufacturer's recommendations, established trade criteria, and all applicable code requirements.
5. Focusing and adjustment of fixtures under the direction of Lighting Consultant.
6. Preparation and submission of complete record drawings.
7. Warranty coverage as required herein.
8. Delivery to Owner of spare lamps and equipment.

1.2 WORK INCLUDED

A. Lighting fixtures, accessories, and lamps, including spare lamps.

B. All materials, accessories, and equipment necessary for a complete lighting fixture installation shall be provided by the Contractor.

C. Integral and remote ballasts, drivers, and/or transformers as required.

The above is for reference only and is not intended to define the limits of the work for a complete installation.

1.3 RELATED WORK IN OTHER SECTIONS

A. General requirements for all electrical work

B. Electrical service

C. Wiring devices for electrical distribution

D. Supporting devices

E. Refurbished Lighting Fixtures

F. Emergency and Exit Lighting

G. Lighting Control Systems

The above is for reference only and is not intended to define the limits of the work for a complete installation.

1.4 SUBMITTALS

A. Pre-Bid.

1. Substitutions.

   a. Requests for fixture and lamp substitutions shall be made no less than ten (10) business days prior to bid due date. No requests for substitutions shall be considered after this time. Requests for substitutions shall be submitted in accordance with the requirements of section 1.4.C.

   b. Specified products are known to be available at the time of construction. Should the Contractor discover that any equipment may be unavailable, it is the Contractor's responsibility to notify the Architect not less than ten (10) business days prior to bid.

   c. Proposed substitute Manufacturers shall have at least ten (10) years' experience in lighting fixture design and fabrication. If requested, the Manufacturer shall submit a representative list of at least 3 projects completed during the above period. Detailed drawings and photographs of the finished products shall be made part of the completed project reference list.

   d. Owner Directed Changes. If the Owner directs the Contractor to submit alternate fixtures for the purpose of reducing the costs, substitutions shall meet or exceed the quality and capabilities of the specified equipment. Such requests for substitutions shall be submitted in accordance with the requirements of section 1.4.C.

   e. If a proposed substitute fails to comply with the Specification requirements, the Contractor shall furnish the acceptable fixture at no additional cost to the Owner, and with no delay to the project.

B. With Bid.

1. All deviations and exceptions from this Specification must be revealed with bid. Deviations and exceptions from the Specification submitted after this time shall not be accepted, whether or not these variations have been formally or informally accepted by the Architect or Lighting Consultant.

2. Manufacturers' catalog numbers listed in the lighting fixture schedule are included to aid in fixture identification. These numbers are subject to periodic change by manufacturers and therefore need to be used in conjunction with the fixture descriptions. Incomplete or obsolete catalog numbers do not indemnify the Contractor from providing equipment as described in the lighting fixture schedule and in this Specification.

3. Fixture Lead Times. Many light fixtures require substantial lead times for delivery. It is the Contractor's responsibility to verify all fixture lead times and to notify the Architect within 2 weeks of contract award if any lead time will not allow them to meet the schedule for project completion.

C. Fixture submittal. The Contractor shall submit shop drawings to the Architect and the Lighting Consultant for review prior to fabrication. Shop drawings prepared solely by a Distributor or Contractor are unacceptable – some Manufacturers will not release orders for submittals they did not prepare. If the Lighting Consultant is required to review submittals prepared by a Distributor / Contractor, and is then required to re-review submittals for the same equipment

prepared by a Manufacturer / Manufacturers Representative, the Contractor shall reimburse the Lighting Consultant, at their current hourly rates, for the duplicate time and expenses incurred.

D. Shop drawings shall contain, at a minimum, the following information:

1. Dimensions, components, weight, and finishes of all equipment and accessories.
2. Indication of fixture mounting conditions and trim type.
3. For continuous linear fixtures, such as coves, submit detailed, dimensioned drawings that indicate lamp, fixture, and ballast/driver configurations, specifications, and locations within their architectural context. Drawings shall be to scale.
4. Complete information on the lamp and/or LED type to be used in each fixture, including manufacturer, current, voltage, wattage, envelope shape and size, envelope type (clear/frosted), beam spread, rated life, correlated color temperature, color rendering index (CRI), color consistency, lumen output, and compatibility with fixtures.
5. Complete photometric performance data as reported by a certified testing laboratory including:
    a. Coefficient of utilization table.
    b. Candlepower data presented in tabular and graphical format.
    c. Zonal lumen summary.
    d. Luminance summary.

    For LED fixtures, provide absolute photometry.
6. Indication of lead time for delivery.
7. Indication by boxed caption of any and all variations from contract Drawings and Specifications, whether or not these variations have been formally or informally accepted by the Architect or Lighting Consultant.
8. Standard catalog cut sheets with insufficient information will not be accepted.
9. Submittals must be prepared by the Manufacturer and/or their local Representative. Submittals prepared by the Distributor or Contractor without the assistance of the Manufacturer and/or their local Representative will not be reviewed or accepted.
10. If requested by the Lighting Consultant, provide samples.

E. Final submittal. As a condition for final approval, the Contractor shall submit to the Architect:

1. Five (5) sets of "As built and approved" drawings showing all systems and components as installed, including all field modifications.
2. “As built and approved” drawings shall include the following information:
    a. Lighting Fixture Schedule.
    b. Approved lighting fixture shop drawings, indicating specifications for all fixtures, lamps, ballasts/transformers, accessories, finishes, manufacturers, catalog numbers, wattages, voltages, and fixture locations.
    c. Manufacturer names and their contact information.
3. Certificates of warranty, as set forth below.

1.5 FINAL REVIEW

A. Upon completion of installation work, the Contractor shall certify in writing that the work is complete and ready for final review.

B. The final review shall be conducted by the Owner, Architect, and Lighting Consultant within fourteen (14) days of the Contractor's notice of completion.

1.6 GENERAL REQUIREMENTS

A. General Conditions of the project contract, work schedules, and site regulations apply to this work.

B. This work shall comply with applicable local codes and the NEC. Fixtures shall carry labels of a Nationally Recognized Testing Laboratory (NRTL), such as UL or ETL.

C. Warranty.

1. The Contractor shall unconditionally warrant all equipment and systems provided under this Section to be free from defects in materials and workmanship for a period of at least twelve (12) months from the date of final acceptance of all work of this Section. Replacement of faulty materials and the cost of labor required for the replacement shall be the responsibility of the Contractor. Lamps and normal wear and tear are exempted.

2. Warranty service shall be performed by personnel in the employ of the Contractor and shall not be sub-contracted or assigned to another company, service, or individual unless the Owner has approved such assignment in writing, in which event the Contractor shall nevertheless be responsible to the Owner for such work.

3. LED Fixtures.

a. Fixture Manufacturer shall provide a minimum 5-year warranty for all components.

b. Replacement components shall match all of the performance characteristics of the originally-installed fixtures and LEDs.

c. Replacement components shall be fully compatible with the original components.

D. State-of-the-art Assurance.

1. All products specified shall be the Manufacturer’s most recent iteration and most recent product. No products shall be accepted if they have been discontinued or superseded at the time of shipment. Should the Manufacturer develop products of comparable function above and beyond the specification of the listed product, the Contractor shall notify the Architect and the Lighting Consultant of any developments to the specified products and shall note any change in the requirements of building infrastructure(s) to support the developments. The Architect and Lighting Consultant shall then determine whether upgraded products shall be accepted.

PART 2 PRODUCTS

1.7 GENERAL

A. Refer to the Lighting Fixture Schedule in the Drawings for fixture and lamp specifications.

B. Verify ceiling type, ceiling thickness, fixture mounting conditions, clearances, and structural suspension system prior to the procurement of fixtures.

C. Provide sufficient clearance surrounding lighting fixtures to meet manufacturers' minimum recommendations and to ensure that fixture operating temperature remains within acceptable limits.

D. Provide mounting hardware as required for a complete installation.

E. Verify the ability to orient adjustable and directional fixtures as indicated on the drawings prior to the procurement of fixtures.

F. Notify the Architect immediately of any conflicts between the specified equipment and the actual mounting conditions.

G. Verify if any recessed fixtures require Plenum or IC ratings. Contractor shall notify the Architect prior to purchasing any fixture that may be in violation of any pertinent building codes, including Plenum or IC requirements.

H. Materials shall be new and free from defects that in any manner may impair their character, appearance, strength, durability, and function. Materials shall be effectively protected from any damage from the time of fabrication until final acceptance of the work.

I. Provide light fixtures complete with lamps, ballasts/drivers/transformers, and accessories as required, as shown on the Drawings, in the Lighting Fixture Schedule, and as required by this Specification.

J. Fixtures shall carry labels of a Nationally Recognized Testing Laboratory (NRTL), such as UL or ETL. Such labels shall be permanently attached in a conspicuous location that does not affect fixture performance or aesthetics.

K. Fixtures shall carry labels identifying the Manufacturer name and contact information, model number, and serial number. Such labels shall be permanently attached in a conspicuous location that does not affect fixture performance or aesthetics.

L. For remote drivers, the Contractor shall verify the maximum allowable distance between the drivers and LED assemblies.

1.8 LAMPS

A. Acceptable manufacturers shall be as specified in the Lighting Fixture Schedule. Requests for lamp substitutions shall be in accordance with the "Submittals" section of this Specification.

B. Provide lamps that meet all of the specified characteristics such as type, base, envelope, wattage, manufacturer, color temperature, color rendering index, lamp life, L.C.L. (light center length), and M.O.L. (maximum overall length).

C. If multiple fixture types have the same lamp specified, all lamps shall be of the same manufacturer, unless noted otherwise in the Lighting Fixture Schedule.

D. Incandescent, tungsten (quartz) halogen, and LED retrofit lamps shall be 120V unless noted otherwise in the Lighting Fixture Schedule.

E. LED Retrofit Lamps.

1. LED retrofit lamps shall have:
    a. Labels of a Nationally Recognized Testing Laboratory (NRTL), such as UL or ETL.
    b. Correlated color temperature (CCT) as specified in the Lighting Fixture Schedule.
    c. Color consistency of each specified fixture type shall be within 3 MacAdam ellipses or better, centered on the black body curve, through L70 and entire dimming range.
    d. Minimum color rendering index (CRI) of 80 or as specified in the Lighting Fixture Schedule.
    e. Rated life, typically L70, is defined as the point in time when the LED lumen output is 70% of the initial lumen output, as tested in accordance with IES LM-80. Minimum rated life at L70 (or greater, i.e. L80, L85, etc.) shall be:
        1) A, MR, and R/BR/PAR LED lamps: 25,000 hours or greater
        2) All other LED lamp types: 15,000 hours or greater
    f. No power consumption in the “off” state.
    g. Smooth, continuous dimming throughout the specified dimming range without flicker or “stepping”, if specified as dimmable.
    h. No audible noise when energized at “full”, or when dimmed (if applicable). Meet or exceed sound class rating of A.
2. Confirm with manufacturers that LED retrofit lamps are compatible with fixtures and associated equipment.
3. LED retrofit lamps shall comply with the LED testing procedures outlined in “LED Fixtures” Section of this Specification.
4. Provide samples if requested by the Lighting Consultant.
5. Contractor shall purchase all specified lamps, including spare lamps, from the same batch to ensure consistent performance.

F. Provide spare lamps, including LED modules (where applicable), for all fixture types. Quantities shall be equal to not less than 10% of the fixture quantity of each type, but in no case less than two (2) lamps per fixture type. Deliver to Owner in clearly labeled cartons.

1.9 FIXTURES - GENERAL

A. Acceptable manufacturers shall be as specified in the Lighting Fixture Schedule. Requests for fixture substitutions shall be in accordance with section 1.4, “Submittals.”

B. Housings shall be so constructed that all electrical components are easily accessible and replaceable without removing fixtures from the mountings or disassembling adjacent construction.

C. Fixtures shall be completely wired at the factory.

D. Fixtures shall be designed to prevent light leaks from around lenses, trim rings and/or frames.

E. Castings shall be free of sand pits, blemishes, scales, and rust, and shall be smoothly finished. Tolerance shall be provided for any shrinkage of the metal castings so that the finished castings will accurately fit in their designated locations.

F. Welds shall be continuous unless specifically approved otherwise by Architect and Lighting Consultant. Welds shall be located and completed so as to present a smooth and unbroken appearance on visual examination of the fixture housing.

G. Socket based fixtures shall be wired with heat resistant wire as required.

H. Final electrical connections for outdoor fixtures shall utilize silicone-filled wire nuts.

I. Recessed fixtures installed in inaccessible ceilings shall be NRTL listed for through wiring with the junction box accessible from the fixture opening.

J. Recessed fixtures shall be equipped with thermal protection devices.

K. Pendant hardware and method of construction shall ensure that fixtures are prevented from rotating from their correct orientation.

L. Mechanically adjustable lighting fixtures shall have reliable heavy-duty locking devices for tilt and rotation.

M. Fixtures that have lamps with oval-shaped beams shall contain locking devices to maintain lamp orientation during lamp replacement or fixture maintenance.

N. Louver, hood and lens devices shall be removable, but positively engaged to the fixture so that they will not drop away during fixture maintenance.

1.10 OPTICAL SYSTEMS

A. Optical systems may use one or more of the following components:

1. Lenses
2. Reflectors
3. Louvers
4. Hoods / snoots

B. Optical systems shall:

1. Produce a smooth distribution of light, absent of striations, color separation, or other aberrations
2. Not alter the color of the light source
3. Be UV stable
4. Be positively retained within the fixture
5. Be resistant to vibration
6. Produce cutoff angles as specified
7. Interchangeable in the field (where specified)
8. Not reduce the rated life of the light source due to heat or other factors

C. For fixtures that require the optical system to be removed to accommodate the fixture installation, the optical system design shall ensure it can only be re-installed in the correct orientation and position.

1.11 LED (LIGHTING EMITTING DIODE) FIXTURES

A. LED fixtures may be configured in one of several ways:

1. Fixtures that utilize field-replaceable LEDs
2. Fixtures that do not utilize field-replaceable LEDs
3. Fixtures that utilize LED retrofit lamps (refer to “Lamps” section of this Specification for additional information)

B. An LED fixture may include the following components:

1. LED
2. Thermal Management System
3. Optical System
4. Driver and/or Power Supply
5. Connectors
6. Control Interface

C. LEDs and fixture components shall be listed by a Nationally Recognized Testing Laboratory (NRTL) such as UL or ETL.

D. LEDs.

1. White light LEDs.
   a. White LED fixtures shall utilize one of the following systems:
      1) Chip-on-board – phosphor is applied directly to LED chip(s)
      2) Remote phosphor – air gap between LED chip(s) and phosphor
   b. Static White LEDs.
      1) Static white LEDs have a fixed correlated color temperature regardless of output.
      2) Correlated color temperature (CCT) as specified in the Lighting Fixture Schedule. Specified CCT shall indicate delivered light from fixture, including any CCT shifting from LED coatings, lenses, etc.
      3) Color consistency of each specified fixture type shall be within 3 MacAdam ellipses or better, centered on the black body curve, through L70 and entire dimming range.
      4) Color rendering index (CRI) greater than or equal to 80 through L70, or as specified in the Lighting Fixture Schedule.
   c. Tunable White LEDs.
      1) Types.
         a) Dynamic white. Correlated color temperature can be adjusted anywhere along the Planckian locus within the specified range, independent of the output.
         b) Dim to warm. Correlated color temperature becomes lower/warmer as output is reduced to simulate the look of halogen dimming.

2) Correlated color temperature (CCT) range as specified in the Lighting Fixture Schedule. Specified CCT shall indicate delivered light from fixture, including any CCT shifting from LED coatings, lenses, etc.

3) Color consistency of each specified fixture type shall be within 3 MacAdam ellipses or better, centered on the black body curve, through L70 and entire CCT and dimming range.

4) Color rendering index (CRI) greater than or equal to 80 through the entire specified CCT range and L70, or as specified in the Lighting Fixture Schedule.

d. Fixture manufacturer shall keep a record of the LED chip manufacturer, bin, production date, CCT, lumen output, mA rating, power consumption, and LM-80 data for all products they provide to help ensure that future replacements are consistent with the original LEDs used.

2. Colored Light LEDs.

a. Static Color LEDs.

1) Static color LEDs shall have fixed color regardless of output.

2) Color / dominant wavelength (nm) as specified in the Lighting Fixture Schedule. Specified LED colors shall indicate delivered light from fixture, including any color / dominant wavelength shifting from LED coatings, lenses, etc.

3) Color consistency of each specified fixture type shall be within 3 MacAdam ellipses or better, through L70 and entire dimming range.

b. Color-Changing LEDs.

1) Color-changing LEDs shall use various static color LEDs that are dimmed and mixed together to create a dynamic range of colored light.

2) Configurations:

a) RGB – red, green, and blue LEDs

b) RGBW – red, green, blue, and white LEDs

c) RGBA – red, green, blue, and amber LEDs

d) RGBWA – red, green, blue, white, and amber LEDs

e) Other LED combinations as specified in the Lighting Fixture Schedule

3) White LEDs in color-changing systems shall meet the requirements of the “White Lights LEDs” section above.

3. Construct fixtures so as to allow the LEDs to be easily accessed and replaced without being removed from the mountings or disassembling adjacent construction.

4. For fixtures with replaceable components, Manufacturer shall offer replacement LED components that match all of the characteristics of the components being replaced. Replacement components shall not void the fixture NRTL listing.

5. For fixtures without replaceable components, Manufacturer shall offer replacement LED fixture that matches all of the characteristics of the fixture being replaced.

E. LED Thermal Management Systems.

1. Fixture and remote devices, if any, shall not exceed component manufacturer’s recommended maximum operating temperatures.

2. Confirm that specified orientation of fixture and mounting methods are approved by the fixture Manufacturer.
3. Provide supplemental thermal management devices / accessories as recommended by manufacturer.
4. Fixture manufacturer shall confirm that specified accessories and finishes do not compromise thermal management.
5. Fixtures shall not rely upon powered, mechanical components, such as fans or SynJet devices, for cooling. Fixtures shall utilize passive cooling methods. Do not substitute specified passive cooling products with active cooling products.
6. Cooling devices shall have a sound class rating of A.

F. LED Optical Systems.

1. Refer to the “Optical Systems” section of this Specification for additional information.

G. LED Drivers and/or Power Supplies.

1. The Driver and Power Supply may be separate components or combined within a single enclosure.
2. The Driver and Power Supply shall manage the power and control the current flow to LEDs.
3. Performance Requirements:
    a. Power output of the Driver and/or Power Supply shall operate LEDs within the specifications provided by the LED chip manufacturer:
        1) AC or DC current to LEDs as required.
        2) Line voltage or low voltage to LEDs as required.
        3) Constant current or constant voltage to LEDs as required
    b. Operate from a 60Hz source of 120 or 277 volts as specified in the Electrical Drawings.
    c. Minimum input power factor of 90%.
    d. Maximum total harmonic distortion (THD) of 20%.
    e. Minimum efficiency of 70% at full rated load of the driver.
    f. Short circuit and overload protection.
    g. Maximum inrush current shall not exceed values established by NEMA standard 410.
    h. Minimum starting temperature of 32°F / 0°C for indoor applications, and -4°F / -20°C for outdoor applications.
    i. Meet or exceed a sound class rating of A.
    j. Comply with the requirements of the Federal Communications Commission (FCC) rules and regulations.
4. Dimming Requirements:
    a. Meet or exceed the dimming range specified in the Lighting Fixture Schedule.
    b. Dim LEDs smoothly and continuously throughout the specified dimming range without flicker or “stepping.”

1) Minimum frequency of 60 Hz

2) Maximum modulation percentage of 0.08 multiplied by the frequency

c. Drivers and/or Power Supplies shall be controlled using one of the following control protocols:

1) Line voltage dimming:

a) Two-wire forward phase

b) Two-wire reverse phase

c) Three-wire forward phase

2) 0-10V

3) DMX

4) DALI

5) Wireless

d. Drivers and/or Power Supplies shall dim LEDs using one of the following methods:

1) Pulse width modulation (PWM)

2) Constant current reduction

3) Constant amperage reduction

4) Hybrid

e. Allow the light output to be maintained at the lowest control setting (prior to off) without dropping out.

f. Refer to Specification Section 26 0933 for additional information regarding control requirements.

5. Mounting.

a. Integral to fixture.

1) Driver shall be installed within or attached to housing by the fixture Manufacturer.

2) Manufacturer shall ensure that driver has sufficient heat dissipation.

3) Driver shall be accessible and removable without the use of tools.

4) Driver shall be field-replaceable without voiding NRTL listing.

b. Remote from fixture.

1) Driver shall be installed where located in the Drawings. Install in accessible locations with sufficient heat dissipation.

2) Do not exceed manufacturer's maximum recommended distance between the LED and driver.

3) Provide plenum rated enclosure where required.

4) Provide wet-listed enclosure where required.

H. LED Interconnected Fixtures.

1. Applies to LED systems where multiple fixtures or segments are daisy-chained together in the field (cove uplights, task lights, tape light, etc.).

2. Fixtures or segments shall be mounted side-by-side for a consistent LED diode pitch (spacing).
3. Provide manufacturer's recommended gap between fixtures to accommodate thermal expansion and accessory installation.
4. Cables shall:
    a. Have NRTL listing that is clearly marked on the cable
    b. Have plenum rating, where required
    c. Have NRTL and/or IP rating that matches fixture rating, where applicable
    d. Leader cables:
        1) Located at the start of a fixture run to connect fixtures back to power supply and/or power source.
        2) Where required, provide an approved wiring compartment in lieu of a leader cable.
    e. Interconnecting cables:
        1) Located in-between fixtures or segments within a single run.
        2) Where required, provide fixtures with permanently-attached cables or conduit connections.
    f. Be installed within conduit, where required
    g. Be secured to the mounting surface and concealed from view
    h. Be provided and assembled by fixture manufacturer
    i. Comply with applicable codes
    j. Finish per Architect
5. Connectors shall:
    a. Have NRTL listing that is clearly marked on the connector
    b. Have plenum rating, where required
    c. Have NRTL and/or IP rating that matches fixture rating, where applicable
    d. Have locking-type assembly, when available
    e. Be provided and assembled by fixture manufacturer. Connectors shall not be soldered on-site
    f. Comply with applicable codes
    g. Finish per Architect

I. LED Control Interfaces.

1. LED Control Interfaces convert control protocols so that the lighting control system and LED drivers can communicate with one another.
2. Utilize one of the following protocols:
    a. 0-10V
    b. DMX
    c. DALI
    d. Wireless

Coordinate with the lighting control system manufacturer to ensure that fixtures and controls are compatible.

3. LED Control Interfaces may communicate with individual or multiple fixtures.
4. Mounting.
   a. Integral to fixture.
      1) Interface shall be installed within or attached to housing by the fixture Manufacturer.
      2) Manufacturer shall ensure that interface has sufficient heat dissipation.
      3) Interface shall be accessible and removable without the use of tools.
   b. Remote from fixture.
      1) Interface shall be installed where located in the Drawings. Install in accessible locations that provide sufficient heat dissipation.
      2) Do not exceed manufacturer's maximum recommended distance between the LED and interface.
      3) Provide plenum and/or wet-listed enclosures where required.

J. LED End-of-Life.
1. LED fixtures shall have a minimum rated life of 50,000 hours at L70, L80, or greater. L70 is the point in time when the LED output is 70% of the initial lumen output, as tested in accordance with IES LM-80.
2. System shall automatically notify occupants when LEDs reach their rated life (L70) through one of the following methods:
   a. Timer function within fixture driver:
      1) Driver sends a signal to the lighting control system.
      2) Contrasting color indicator turns on within fixture and remains on until the LED has been replaced.
   b. Timer function within lighting control system:
      1) Lighting Control System notifies user that LEDs need to be replaced.

K. LED Manufacturers.
1. The following LED manufacturers shall be acceptable assuming they are capable of meeting or exceeding the specifications in this Section and the Lighting Fixture Schedule:
   a. Bridgelux
   b. Citizen
   c. Cree
   d. General Electric
   e. Lumenetix
   f. Lumileds
   g. Nichia
   h. Osram Sylvania
   i. Philips

j. Samsung

k. Soraa

l. Toshiba

m. Xicato

Other manufacturers may be considered with the prior review of the Lighting Consultant. Manufacturers seeking review must contact the Lighting Consultant no later than ten (10) days prior to bid date.

2. The following LED Driver and/or Power Supply manufacturers shall be acceptable assuming they are capable of meeting or exceeding the specifications in this Section and the Lighting Fixture Schedule:

a. EldoLED

b. General Electric

c. Lutron

d. Osram Sylvania

e. Philips Advance

Other manufacturers may be considered with the prior review of the Lighting Consultant. Manufacturers seeking review must contact the Lighting Consultant no later than ten (10) days prior to bid date.

L. LED Testing.

1. Fixtures and components shall be manufactured and tested based on Approved Methods as stated in the following standards:

a. IES LM-79 - “Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products.”

b. IES LM-80 – “Approved Method for Measuring Lumen Maintenance of LED Light Sources.”

c. IES TM-21 – “Lumen Depreciation Lifetime Estimation Method for LED Light Sources.”

2. Manufacturers shall provide this testing data if requested by the Lighting Consultant.

1.12 ELECTRICAL COMPONENTS

A. Electrical components shall carry labels of a Nationally Recognized Testing Laboratory (NRTL), such as UL or ETL., shall be of substantial construction, and shall meet or exceed industry standards and trade practices.

B. Lampholders shall be suitable for outdoor applications when properly enclosed in a fixture that is NRTL listed for wet location.

C. Lead wires and lampholders shall have a minimum temperature rating of 200°C. Lead wires shall be rated at or above the lampholder rating.

D. Internal Fixture Wiring.

1. Wiring methods shall meet or exceed the requirements as established by NEC and approved standards organizations.

2. Wiring shall maintain earth ground to all components. Conductors shall not be smaller than 18-gauge.
3. Electrical connection shall be through mounting brackets as shown in the Drawings.
4. Normal and Emergency conductors and all associated electrical components shall be isolated from each other when housed in the same fixture.
5. Fixtures that are wired with Normal and Emergency power shall be fed separately. Manufacturer shall keep all wiring and associated electrical components in separate compartments and raceways. Compartments shall be separated with a barrier as recommended by the Manufacturer.
6. Fixture voltage(s) per the specifications in the Electrical Drawings.
7. Circuiting as shown in the Drawings. All circuits shall be 2-wire, with no common neutrals. For fixtures with multiple circuits, Manufacturer shall clearly label conductors with circuit numbers.
8. Lead wires shall be provided 12 in. in length beyond fixture entry point.

1.13 MOUNTING SYSTEMS

A. The following requirements refer to canopies, mounting plates, mounting arms, stems, chains, cables, and associated hardware required to support the fixtures.

B. Manufacturer shall provide all required mounting system components as part of the work of this Section, including fasteners, safety cables, anchors, etc.

C. Mounting system components and associated hardware shall be designed and fabricated to support entire weight of fixture and components.

D. Suspension mechanisms shall be designed and engineered by the Manufacturer to assure that the fixture remains level and in balance.

E. If indicated in the Drawings, Manufacturer shall coordinate suspension mechanism with the specified winch system.

F. Safety cables shall be concealed within fixture stems.

G. Chains shall be designed to prevent spinning of fixture and maintain fixture orientation.

H. Suspension and safety cables shall be selected using a minimum safety factor of 3:1.

I. Suspension chains shall be welded link and shall be selected using a minimum safety factor of 3:1.

J. Wherever possible, Manufacturer shall minimize the appearance of exposed fasteners.

K. Finish(es) per Architect.

1.14 ENCLOSURES

A. Enclosures shall be categorized as follows:

1. Fixture Enclosures. Enclosures shall be designed and fabricated to house and protect fixtures that are rated for dry or damp location use.

2. Ballast / Driver / Transformer Enclosures. Enclosures shall be designed and fabricated to house and protect ballasts/drivers/transformers that are rated for dry or damp location use.

B. Enclosures shall be completely sealed and rated for outdoor use.

C. Enclosures shall be rated NEMA Type 3 or higher.

D. Enclosure finish(es) shall be as specified in the Lighting Fixture Schedule.

E. Enclosure locations and mounting orientations shall be as specified in the Drawings.

F. Electrical feed locations shall be properly sealed to prevent moisture from entering the enclosures.

G. Enclosures and hardware shall be made of UV-stabilized materials that are resistant to corrosion.

H. Enclosures and hardware shall be designed for long-term, permanent exterior installations.

I. Fixture Enclosures.

1. Enclosures shall be designed for use with the specified lighting fixture. Enclosures shall be approved by fixture Manufacturer for use with the specified lighting fixture.

2. Enclosures shall be designed to allow sufficient air circulation around fixture for heat dissipation. Enclosure shall include integral fan, if required, to maintain fixture's recommended maximum operating temperature.

3. Enclosures shall allow for easy access to the fixture for re-lamping and maintenance without disturbing the aim and focus of the fixture.

4. Enclosures shall not obstruct the lighting distribution of the specified lighting fixture.

5. Enclosures shall be designed to prevent light leaks.

6. Enclosures shall be capable of accommodating accessories specified in the Lighting Fixture Schedule.

7. Adjustable enclosures shall have reliable heavy-duty locking devices for tilt and rotation.

J. Ballast / Driver / Transformer Enclosures.

1. Enclosures shall be designed for use with the specified ballast / driver / transformer. Enclosures shall be approved by ballast /driver / transformer Manufacturer for use with the specified product.

2. Enclosures shall be designed to allow for proper heat dissipation from ballast /driver / transformer.

3. Enclosures shall allow for easy access to the ballast / driver / transformer for maintenance.

PART 2 - EXECUTION

2.1 FABRICATION

A. Operating elements shall be mechanically safe and electrically "dead."

B. Internal wiring shall be factory completed. All wiring shall be in harnesses and bound. No loose or randomly routed wires shall be permitted.

C. Wire sizes and insulations shall comply with NEC, UL, and local codes and meet or exceed electronics industry standards.

2.2 PACKING AND SHIPPING

A. Equipment shall be wrapped, sealed, and substantially crated for shipment. Crates shall clearly indicate equipment contained.

B. Deliver and store materials in Manufacturer’s original packaging labeled to show project name, project fixture type, Manufacturer name, and model number.

C. Store materials in protected, dry, elevated location and in accordance with Manufacturer’s instructions. Do not open packaging or remove labels until time for installation.

2.3 INSTALLATION

A. Install items in conformity with standard trade practices and Manufacturer's recommendations. Position all items accurately as indicated in the Drawings, and true to plumb line and level. Maintain maximum headroom and clearance at all points.

B. Consult and coordinate work with trades doing adjoining work.

C. Mount all fixtures so as to maintain the fixtures' full range of motion.

D. Where noted on the drawings, the exact location of fixtures shall be confirmed in the field with the consultation of the Lighting Designer and the Architect prior to installation.

E. Many fixture locations are determined to provide maximum performance and accessibility for maintenance. When field conditions require fixtures to be relocated, it is the Contractor’s responsibility to notify the Architect and Lighting Consultant prior to installation.

F. Align continuous linear fixtures with one another to ensure precise alignment and consistent appearance.

G. Support surface-mounted fixtures directly from the building structure.

H. Provide temporary lighting, power, and wiring for the performance of all trades, for the entire period of construction, and remove all temporary wiring at the completion of construction. Temporary lighting hung from the existing chandelier positions shall have a similar scale, lumen output, and color temperature relative to the original fixtures. Review proposed temporary lighting selections with Architect prior to purchasing.

I. Fixtures that are part of the work of this Section shall not be utilized for job site illumination during construction. All lamps shall be substantially new upon completion.

J. Protect lighting equipment from paint, dirt, and debris during construction.

K. Installation and care of LED fixtures:

1. LED components (such as LED boards, heat sinks, active cooling devices, drivers, etc.) are particularly susceptible to permanent degradation and/or damage from debris and dust.
2. LED components that are not sealed or enclosed by a lens shall be installed only after all dust-generating activities and preliminary cleaning have been completed.
3. Failure to properly protect LED components from construction dust and debris could void the Manufacturer's warranty.
4. Contractor shall replace any LED components and/or fixtures damaged by construction dust and debris at their cost.

L. Upon completion of the Work, fixtures shall be cleaned and be free of fingerprints, dust, or any debris. Refer to Manufacturer's instructions for proper cleaning methods and materials.

2.4 FIXTURE FOCUSING AND ADJUSTMENT

A. Notify the Architect and Lighting Consultant at least 10 business days in advance of the project completion date in order to schedule the fixture focusing sessions.

B. The final focusing, aiming, and adjustment of fixtures in this Section shall be supervised by the Lighting Consultant.

C. The Contractor shall coordinate with the other trades and the Owner to ensure that fixtures specified by the Lighting Consultant are accessible.

D. The Contractor shall coordinate with the other trades and the Owner to ensure that focusing sessions are scheduled during times when all of the light fixtures can be turned off / on during the entire duration of the sessions. Individual circuits shall have the ability to be turned on / off independently of the other lighting circuits.

E. The Contractor shall provide means of accessing all lighting fixtures such as ladders, lifts, and scaffolding; such means of access shall not obstruct the line of sight between any fixture and its intended aiming point. Provide two (2) means of access for each fixture mounting height in order to have two focusing teams working at the same time.

F. The Contractor shall provide a crew of two (2) persons, including the job supervisor, for one (1) six-hour evening focusing session.

G. The Contractor shall, at the consultant's current hourly rates, reimburse the Lighting Consultant for all time and expenses incurred for any additional focusing sessions that are required due to:

1. Incomplete or incorrect installation.
2. Insufficient crew.
3. Lack of access to all fixtures.
4. Missing or malfunctioning lifts, ladders, and/or scaffolding for accessing fixtures.
5. Insufficient or incorrect tools to open, adjust, and lock fixtures.
6. Missing, malfunctioning, or incorrect fixtures.
7. Malfunctioning, or incorrect ballasts / drivers / transformers.

8. Missing or incorrect fixture accessories.
9. Missing, malfunctioning, or incorrect lamps. (Note: lamps must be exactly as specified, including characteristics such as color temperature, beam spread, wattage, voltage, etc.).
10. Equipment and/or obstructions between a fixture and its intended aiming point.
11. Lack of spare lamps.
12. Incomplete or unfinished walls, ceilings, or other architectural elements.
13. Missing or incomplete exhibits, artwork, furnishings, room finishes, and/or other objects that are to be illuminated.

H. If any fixtures are moved out of adjustment or position after they have been focused, the Lighting Consultant shall be reimbursed, at their current hourly rates, for all time and expenses incurred for any additional focusing sessions that are required.

END OF SECTION

PART 1 GENERAL

1.1 SCOPE

A. All materials, components, and services necessary to provide a complete system indicated in this Section, as specified herein and shown on related Drawings, including:

B. Verification of dimensions and conditions at the job site to ensure proper fitting of the work.

C. Preparation and submission of complete shop drawings, fixture specification submittals, prototype(s), and samples for approval prior to fabrication.

D. Disconnection and removal of existing fixtures from the job site. Salvage for Owner or re-use, and storage of equipment in a secure location.

E. Restoration of refurbished lighting fixtures.

F. Shipment of equipment to the job site.

G. Installation and completion in accordance with these Specifications, related Drawings, the Equipment Manufacturer's recommendations, established trade criteria, and all applicable code requirements

H. Preparation and submission of complete record drawings.

I. Delivery to Owner of spare lamps and equipment.

J. Warranty coverage as required herein.

1.2 WORK INCLUDED

A. Refurbishment of the following fixture types (including all materials and accessories):

1. Type SR1
2. Type SR2
3. Type SR3
4. Type SR4
5. Type SR5

B. Lamps, including spare lamps, for the fixture types above.

The above is for reference only and is not intended to define the limits of the work for a complete installation.

1.3 RELATED WORK IN OTHER SECTIONS

A. General requirements for all electrical work

B. Electrical service

C. Wiring devices for electrical distribution

D. Supporting devices

E. Lighting Fixtures, Lamps, & Drivers

F. Lighting Control System

1.4 QUALITY ASSURANCE

A. The fabrication and refurbishment work of this Section shall be the responsibility of a single Manufacturer specializing in custom lighting and metal fabrications. The Contractor and Manufacturer shall assume complete responsibility for the work in this Section and shall hold the Owner, Architect, Lighting Consultant, and all their Employees and Consultants harmless for any costs for errors or omissions associated with the work of this Section and any action arising therefrom.

B. The Manufacturer shall have at least ten (10) years' experience in custom lighting fixture fabrication and refurbishment. If requested, the Manufacturer shall submit a representative list of at least 3 projects completed during the above period. Detailed drawings and photographs of the finished products shall be made part of the completed project reference list.

C. The Manufacturer shall perform the work of this Section in accordance with standards set forth by Underwriters Laboratories (UL). Manufacturer shall be approved by UL to certify that each fixture in this Section meets those standards. Manufacturer shall adhere the appropriate UL label (dry locations, damp locations, wet locations, etc.) to each fixture.

D. If requested, the Manufacturer shall allow Owner’s representatives and the Architect and Lighting Consultant to visit the proposed manufacturing facilities to approve the set-up and facility.

E. The Manufacturer and Contractor shall carry sufficient insurance coverage to cover the cost of fabricating a replica(s) of the original lighting fixtures, if needed, should any of the original fixtures be damaged, stolen, or lost while they are removed, packaged, transported, refurbished, and/or re-installed.

F. Components of similar type shall be the product of one Manufacturer or Supplier.

G. Acceptable manufacturers are as specified in the Lighting Fixture Schedule.

1.5 SUBMITTALS

A. Pre-Bid.

1. Substitutions.

a. Requests for fixture and lamp substitutions shall be made no less than ten (10) business days prior to bid due date. No requests for substitutions shall be considered after this time. Requests for substitutions shall be submitted in accordance with the requirements of this Section.

b. Specified products are known to be available at the time of construction. Should the Contractor discover that any equipment may be unavailable, it is the Contractor’s responsibility to notify the Architect not less than ten (10) business days prior to bid.

c. Owner Directed Changes. If the Owner directs the Contractor to submit alternate fixtures for the purpose of reducing the costs, substitutions shall meet or exceed the quality and capabilities of the specified equipment. Such requests for

substitutions shall be submitted in accordance with the requirements of this Section.

d. If a proposed substitute fails to comply with the Specification requirements, the Contractor shall furnish the acceptable fixture at no additional cost to the Owner, and with no delay to the project.

B. With Bid.

1. All deviations and exceptions from this Specification must be revealed with bid. Deviations and exceptions from the Specification submitted after this time shall not be accepted, whether or not these variations have been formally or informally accepted by the Architect or Lighting Consultant.

2. For third-party lighting fixtures integrated into custom or refurbished fixtures, Manufacturers' catalog numbers listed in the lighting fixture schedule are included to aid in fixture identification. These numbers are subject to periodic change by manufacturers and therefore need to be used in conjunction with the fixture descriptions. Incomplete or obsolete catalog numbers do not indemnify the Contractor from providing equipment as described in the lighting fixture schedule and in this Specification.

3. Fixture Lead Times. Many light fixtures require substantial lead times for delivery. In addition, the process of fabricating, reviewing, and modifying prototypes will increase this lead time. It is the Contractor's responsibility to verify all fixture lead times, including lead times related to prototypes, and to notify the Architect within 2 weeks of contract award if any lead time will not allow them to meet the schedule for project completion.

C. Fixture submittal. The Contractor shall submit shop drawings to the Architect and the Lighting Consultant for review prior to fabrication. Shop drawings shall contain, at a minimum, the following information:

1. Complete description of all proposed cleaning, manufacturing, and/or assembly techniques and materials for the fabrication and/or restoration work.

2. Dimensioned fixture plans, elevations, and sections.

3. Itemized list and specifications of all third-party lamps and accessories that are part of the overall fixture.

4. Indicate overall fixture weight, materials, methods, finishes and types of joinery, fasteners, anchorages, and accessory items. Specify all finishes.

5. Setting diagrams and templates for anchorages, sleeves and bolts.

6. Complete information on the lamp and/or LED type to be used in each fixture, including manufacturer, voltage, wattage, envelope shape and size, envelope type (clear/frosted), beam spread, lamp life, color temperature, and color rendering index (CRI).

7. Indication of fixture mounting conditions and trim type.

8. Indication by boxed caption of any and all variations from contract Drawings and Specifications, whether or not these variations have been formally or informally accepted by the Architect or Lighting Consultant.

9. Indication of lead time for delivery after prototype and final submittals have been reviewed and approved.

10. In-progress digital photos at the 25%, 50%, and 75% stages of completion of the fixture construction / fabrication process.

D. Samples:

1. Provide samples of the following materials:
    a. Glass
    b. Fabric
    c. Metal finishes
    d. Paint finishes
2. Submit samples, 6" square, of proposed materials as requested. Submit samples to the Architect. Label samples to indicate product characteristics and locations.
3. Up to three (3) sample options may be required for each different material without additional compensation.
4. Provide samples of the following components:
    a. Suspension system
    b. Fasteners
    c. Accessories, including lenses, louvers, baffles, etc.
5. Submit sample of any additional fixture component or material requested by the Lighting Consultant or the Architect.
6. Samples are not returnable, nor included in quantities required for the project.
7. Samples shall be reviewed to determine if they meet the Architect and Lighting Consultant's requirements. When accepted, samples shall serve as the standard for materials, workmanship, and appearance for such work throughout the project. Any necessary adjustments to samples shall be made prior to commencing fabrication of the prototype(s) and/or final fixture(s). Acceptance of these samples shall not constitute the approval or partial approval of the fixture type. Final approval of the fixture type shall be conducted during the prototype review.

E. Prototype Factory Review(s).
1. The Manufacturer shall prepare a prototype for the following fixture types:
    a. Type SR1
    b. Type SR4
    c. Type SR5
2. Prototypes shall utilize the same materials and mounting methods as intended for the final work. Prototypes shall be provided complete and fully operational, including the specified lamps, finishes, electrical components, wiring configuration(s), mounting hardware, accessories, etc.
3. Notify the Architect and Lighting Consultant at least 5 business days in advance of the prototype completion date in order to schedule the prototype review session.
4. Prototypes may be included in the total fixture quantity required for the project if they meet all requirements of this Section, the project documentation, and is approved by the Lighting Consultant and Architect.
5. Prototypes shall be accessible for complete review.
6. Prototypes shall be installed in a dark room where other light sources can be separately controlled and blackout shades are provided to control daylight. Manufacturer shall be prepared to perform nighttime review if darkened room is unavailable.

7. Manufacturer shall prepare revised prototypes as requested by the Lighting Consultant and/or Architect until all requirements of this Section and the project documentation are met, and the prototype has been reviewed and approved by the Lighting Consultant and Architect. Multiple revisions may be required.

8. When accepted, prototypes shall serve as the standard for materials, workmanship, and appearance for such work throughout the project.

F. Final submittal. As a condition for final approval, the Contractor shall submit to the Architect and Owner within one (1) month of completion of the project:

1. Five (5) sets of "As built and approved" drawings showing all systems and components as installed, including all field modifications.

2. “As built and approved” drawings shall include the following information:

a. Lighting Fixture Schedule.

b. Approved lighting fixture shop drawings, indicating specifications for all fixtures, lamps, ballasts/transformers, accessories, finishes, manufacturers, catalog numbers, wattages, voltages, and fixture locations.

c. Manufacturer names and their contact information.

3. Certificates of warranty, as set forth below.

1.6 FINAL REVIEW

A. Upon completion of installation work, the Contractor shall certify in writing that the work is complete and ready for final review.

B. The final review shall be conducted by the Owner, Architect, and Lighting Consultant within fourteen (14) days of the Contractor's notice of completion.

1.7 GENERAL REQUIREMENTS

A. General Conditions of the project contract, work schedules, and site regulations apply to this work.

B. This work shall comply with applicable local codes and the NEC. Fixtures shall carry labels of a Nationally Recognized Testing Laboratory (NRTL), such as UL or ETL.

C. Warranty.

1. The Contractor shall unconditionally warrant all equipment and systems provided under this Section to be free from defects in materials and workmanship for a period of at least twelve (12) months from the date of final acceptance of all work of this Section. Replacement of faulty materials and the cost of labor required for the replacement shall be the responsibility of the Contractor. Lamps and normal wear and tear are exempted.

2. Warranty service shall be performed by personnel in the employ of the Contractor and shall not be sub-contracted or assigned to another company, service, or individual unless the Owner has approved such assignment in writing, in which event the Contractor shall nevertheless be responsible to the Owner for such work.

D. Special Warranty.

1. Unconditionally warrant all finishes provided under this Section to be free from noticeable changes such as corrosion, oxidation, fading, chipping, and yellowing for a period of five (5) years from the date of final acceptance of all work of this Section. Replacement of

faulty materials and the cost of labor required for the replacement shall be the responsibility of the Contractor.

2. Unconditionally warrant all lenses provided under this Section to be free from noticeable changes such as fading, chipping, and yellowing for a period of five (5) years from the date of final acceptance of all work of this Section. Replacement of faulty materials and the cost of labor required for the replacement shall be the responsibility of the Contractor.

3. LED Fixtures.

   a. Fixture Manufacturer shall provide a minimum 5-year warranty for all components.

   b. Replacement components shall match all of the performance characteristics of the originally-installed fixtures and LEDs.

   c. Replacement components shall be fully compatible with the original components.

PART 2 - PRODUCTS

2.1 GENERAL

A. Refer to specification Section 265010, “Lighting Fixtures, Lamps, & Drivers.”

2.2 LAMPS

A. Refer to specification Section 265010, “Lighting Fixtures, Lamps, & Drivers.”

2.3 FIXTURES – GENERAL

A. Refer to specification Section 265010, “Lighting Fixtures, Lamps, & Drivers.”

B. Appropriate cleaning solution(s) shall be used to ensure that existing finishes are protected.

C. Minimize visibility of exposed hardware.

D. Lamp Mounting and Positioning.

1. Lamps shall be fully accessible without disassembling fixture components or removing fixture from mounting location.

2. When backlighting a translucent material, lamps shall be positioned at the proper orientation and distance from its surface to maximize the lighting uniformity.

3. Lamps shall be positioned at the proper orientation and distance from all surfaces so as to prevent deformation, melting, or combustion of materials.

4. Sockets shall be positioned so as to orient the lamp in the burning position recommended by the lamp manufacturer.

2.4 MATERIALS

A. Materials shall be as indicated in the Drawings, Fixture Cutsheets, and in this Specification.

B. Where not noted, finishes shall be as selected by the Architect.

C. Brackets and supplementary supporting members required to mount lighting fixtures shall be furnished as part of the work of this Section.

D. Welding Electrodes and Filler Material.

1. Electrodes and filler material shall comply with the AWS standards and shall be selected for the type and alloy of metal to be welded, and as required for color match, strength and compatibility.
2. Weld connections shall comply with AWS standards for procedures, appearance, quality of welds and methods used for correcting welded work.
3. Weld connections shall comply with AISC standards for bearing, adequacy of temporary connections, alignment and removal of paint on adjacent surfaces.
4. Verify that weld size, fabrication sequence, and equipment used will limit distortions to allowable tolerances. Prevent surface bleeding of backside welding on exposed surfaces. Grind smooth fillet welds ½ in and larger, and grind flush butt welds. Dress exposed welds.
5. Welds shall be continuous unless specifically approved otherwise by Architect and Lighting Consultant. Welds shall be located and completed so as to present a smooth and unbroken appearance on visual examination of the fixture housing.

E. Finishes.

1. Paints, coatings, and other finishes shall be selected on the basis of color, finish, durability, compatibility with base material, and resistance to heat, corrosion, and other environmental elements.
2. Individual components shall be painted separately prior to assembly of the overall fixture, unless specifically approved by the Architect or Lighting Consultant.
3. Paints, coatings, and other finishes shall be applied so as to achieve a uniform appearance that is devoid of spots, streaks, and imperfections, and is consistent among all fixtures of its type.
4. Fixtures shall have a clear protective finish for maximum resistance to corrosion. Fixture's final appearance shall match finish sample approved by Architect and Lighting Consultant.

F. Fasteners.

1. Wherever feasible, re-use existing fasteners.
2. Fasteners shall be constructed of basic metal and alloy, and shall match the finished color and texture of the metal being fastened, unless otherwise indicated.
3. Where feasible, provide captive screws for all access panels required for servicing lamps and ballasts.
4. Exposed screws shall be Phillips flat-head, unless noted otherwise.
5. Captive screws shall be stainless steel and shall have undercut threads in order to retain position of screw without the use of rubber. Where extruded aluminum is used for housing material, stainless steel threaded inserts shall be used.
6. Conceal fasteners wherever possible. All screws, rivets, and clips used for fastening components shall be located and installed so as to present a smooth and unbroken appearance upon visual examination of external section of the fixture housing.

G. Corrosion Resistance.

1. Manufacturer shall verify that each fixture and its components are suitable for the potential for corrosion of the respective mounting environment.

2. Paint shall have corrosion resistant properties and shall be applied in a smooth, even application to seal the metal off from atmospheric oxygen and moisture.
3. Prepare surfaces adequately prior to the application of any protective coating system or corrosion inhibitor.
4. Care shall be taken when mixing metals. Components shall be made of metals of compatible galvanic series. Where required, an appropriate barrier shall be provided between dissimilar metals.
5. When joining surfaces, care shall be taken to avoid crevices.
6. Ensure that metal parts have a sacrificial coating or barrier coating before they are bolted or clamped together.
7. When bending metals, a generous bending radius shall be used to minimize the creation of internal tensile stresses.
8. When washing components made of dissimilar metals, de-ionized water shall be used and they shall be dried quickly and thoroughly.

H. Anchors and inserts shall be provided where required for the installation of ornamental fixture items. Provide toothed steel or lead shield expansion bolt devices for drilled-in-place anchors. Provide galvanized or cadmium-coated anchors and inserts for exterior installation.

I. Suspension mechanism.

1. Method of suspension shall be as shown in the Drawings and shall be designed and engineered by the Manufacturer to support the full weight of the fixture, including lamps, ballasts / transformers, and accessories, using a minimum safety factor of 2:1.
2. Suspension mechanisms shall be designed and engineered by the Manufacturer to assure that the fixture remains level and in balance.
3. If indicated in the Drawings, suspension mechanism shall be designed and engineered by the Manufacturer to prevent rotation after installation.
4. If indicated in the Drawings, Manufacturer shall coordinate suspension mechanism with the specified winch system.
5. Electrical feed shall be as shown in the Drawings, and shall be routed through suspension mechanism in compliance with NRTL approved methods. Power cord finish shall match finish of suspension hardware.

J. Cutting, Stamping, and Punching.

1. Material cutting shall match patterns shown in the Drawings.
2. Patterns shall be consistent from fixture to fixture.
3. Care shall be taken to eliminate all burrs and sharp edges.
4. Finished panels shall maintain their rigidity.

K. Castings.

1. Castings shall match existing fixture castings.
2. Castings shall be consistent from fixture to fixture.
3. Care shall be taken to eliminate all burrs and sharp edges.
4. Minimize visibility and size of all seams between castings.
5. Copper alloy castings shall meet the requirements of ASTM B824-04.

6. Aluminum alloy sand castings shall meet the requirements of ASTM B 26
7. Aluminum alloy die castings shall meet the requirements of ASTM B85-03
8. Gray Iron castings shall meet the requirements of ASTM A48, Class 30.
9. Malleable Iron castings shall meet the requirements of ASTM A47, Grade 32510.

L. Glass Shades.

1. Lenses / panels shall be:
   a. Resistant to heat from adjacent lamps and electrical components / tempered
   b. Consistent from shade to shade
   c. Free of burrs, sharp edges, chips, cracks, bubbles, etc.
   d. Low iron content to prevent green color shift
   e. Minimum thickness: 3/16 in.
   f. 50%+ transmissive
   g. UV stable
   h. Fritted / frosted / etched / sandblasted / textured as specified
   i. Color fast to prevent fading over time
   j. Matched to existing shades and/or photos provided by design team
2. Provide attic stock of glass shades. Quantities shall be equal to and not less than 10 percent for the glass shade quantity of each fixture type, and in no case shall quantities be less than 2 per fixture type. Deliver fixture to Owner wrapped and sealed in polyethylene and substantially crated for shipment. Containers shall clearly indicate equipment contained.

2.5 PATTERNS AND FILTERS

A. Refer to specification Section 26 50 10, “Lighting Fixtures, Lamps, & Drivers.”

2.6 ELECTRICAL COMPONENTS

A. Refer to specification Section 26 50 10, “Lighting Fixtures, Lamps, & Drivers.”

2.7 LED DRIVERS AND TRANSFORMERS

A. Refer to specification Section 26 50 10, “Lighting Fixtures, Lamps, & Drivers.”

B. If required, driver/ballast/transformer enclosures shall be designed to allow devices to operate within their operating temperature range as recommended by the device manufacturer.

C. Driver/ballast/transformer locations as shown in the Drawings.

2.8 MOUNTING SYSTEMS

A. The following requirements refer to canopies, mounting plates, mounting arms, stems, chains, cables, and associated hardware required to support the fixtures.

B. Manufacturer shall provide all required mounting system components as part of the work of this Section, including fasteners, safety cables, anchors, etc.

C. Mounting system components and associated hardware shall be designed and fabricated to support entire weight of fixture and components.

D. Safety cables shall be concealed within fixture stems.

E. Chains shall be designed to prevent spinning of fixture and maintain fixture orientation.

F. Suspension and safety cables shall be selected using a minimum safety factor of 3:1.

G. Suspension chains shall be welded link and shall be selected using a minimum safety factor of 3:1.

H. Wherever possible, Manufacturer shall minimize the appearance of exposed fasteners.

I. Finish: TBD

J. Mounting system components shall be as shown in the Drawings.

2.9 MOUNTING HARDWARE

A. Refer to specification Section 26 50 10, “Lighting Fixtures, Lamps, & Drivers.”

PART 3 - EXECUTION

3.1 REMOVAL AND HANDLING

A. Label each fixture to identify its existing location.

B. Disconnect and remove fixtures.

C. Carefully disassemble fixtures if required for shipment. Label each fixture part to facilitate accurate re-assembly.

D. Package and transport fixtures so that they arrive at the Manufacturer’s facility in the same condition as when removed from the site.

3.2 FABRICATION

A. Clean, refurbish, and refinish fixtures as shown in the Drawings, Fixture Cutsheets, and Lighting Fixture Schedule.

B. Re-wire / replace existing fixture components and re-lamp as shown in the Drawings, Fixture Cutsheets, and Lighting Fixture Schedule.

C. Incorporate new lighting components within existing fixtures as shown in the Drawings, Fixture Cutsheets, and Lighting Fixture Schedule.

D. Electrical wiring.

1. Internal wiring shall be completed by factory. All wiring shall be in harnesses and bound. No loose or randomly routed wires shall be permitted.
2. Conductors shall be routed to avoid obstructing or shadowing of light on reflectors and lenses.

3. Unless otherwise shown in the Drawings, conductors shall be completely concealed.
4. Exposed conductors shall be routed as shown in the Drawings. Finish per Architect.
5. Wire sizes and insulations shall comply with NEC, UL, and local codes and meet or exceed electronics industry standards.

E. For fixtures requiring assembly at the site, all parts shall be carefully labeled to facilitate the re-assembly. Provide drawing indicating part numbers and assembly sequence.

3.3 PACKING AND SHIPPING

A. Equipment shall be wrapped, sealed, and substantially crated for shipment. Crates shall clearly indicate equipment contained.

B. Deliver and store materials in Manufacturer's original packaging labeled to show project name, project fixture type, Manufacturer name, and model number.

C. Store materials in protected, dry, elevated location and in accordance with Manufacturer's instructions. Do not open packaging or remove labels until time for installation.

D. Provide sufficient insurance coverage to cover the cost of fabricating a replica(s) of the original lighting fixtures, if needed, should any of the original fixtures be damaged, stolen, or lost while they are packaged and transported.

3.4 INSTALLATION

A. Refer to specification Section 26 50 10, "Lighting Fixtures, Lamps, & Drivers."

B. Re-install fixture / elements of fixture in the original locations

C. Where indicated in the Drawings, install pendant in correct orientation**.**

3.5 FIXTURE FOCUSING AND ADJUSTMENT

A. Refer to specification Section 26 50 10, "Lighting Fixtures, Lamps, & Drivers."

END OF SECTION

PART 1 GENERAL

1.1 SCOPE

A. All materials, components, and services necessary to provide a complete system indicated in this Section, as specified herein and shown on related Drawings, including:

B. Verification of dimensions and conditions at the job site to ensure proper fitting of the work.

C. Preparation and submission of complete shop drawings, fixture specification submittals, prototype(s), and samples for approval prior to fabrication.

D. Disconnection and removal of existing fixtures from the job site. Salvage for Owner or re-use, and storage of equipment in a secure location.

E. Restoration of refurbished lighting fixtures.

F. Shipment of equipment to the job site.

G. Installation and completion in accordance with these Specifications, related Drawings, the Equipment Manufacturer's recommendations, established trade criteria, and all applicable code requirements

H. Preparation and submission of complete record drawings.

I. Delivery to Owner of spare lamps and equipment.

J. Warranty coverage as required herein.

1.2 WORK INCLUDED

A. Refurbishment of the following fixture types (including all materials and accessories):

1. Type SR1
2. Type SR2
3. Type SR3
4. Type SR4
5. Type SR5

B. Lamps, including spare lamps, for the fixture types above.

The above is for reference only and is not intended to define the limits of the work for a complete installation.

1.3 RELATED WORK IN OTHER SECTIONS

A. General requirements for all electrical work

B. Electrical service

C. Wiring devices for electrical distribution

D. Supporting devices

E. Lighting Fixtures, Lamps, & Drivers

F. Lighting Control System

1.4 QUALITY ASSURANCE

A. The fabrication and refurbishment work of this Section shall be the responsibility of a single Manufacturer specializing in custom lighting and metal fabrications. The Contractor and Manufacturer shall assume complete responsibility for the work in this Section and shall hold the Owner, Architect, Lighting Consultant, and all their Employees and Consultants harmless for any costs for errors or omissions associated with the work of this Section and any action arising therefrom.

B. The Manufacturer shall have at least ten (10) years' experience in custom lighting fixture fabrication and refurbishment. If requested, the Manufacturer shall submit a representative list of at least 3 projects completed during the above period. Detailed drawings and photographs of the finished products shall be made part of the completed project reference list.

C. The Manufacturer shall perform the work of this Section in accordance with standards set forth by Underwriters Laboratories (UL). Manufacturer shall be approved by UL to certify that each fixture in this Section meets those standards. Manufacturer shall adhere the appropriate UL label (dry locations, damp locations, wet locations, etc.) to each fixture.

D. If requested, the Manufacturer shall allow Owner’s representatives and the Architect and Lighting Consultant to visit the proposed manufacturing facilities to approve the set-up and facility.

E. The Manufacturer and Contractor shall carry sufficient insurance coverage to cover the cost of fabricating a replica(s) of the original lighting fixtures, if needed, should any of the original fixtures be damaged, stolen, or lost while they are removed, packaged, transported, refurbished, and/or re-installed.

F. Components of similar type shall be the product of one Manufacturer or Supplier.

G. Acceptable manufacturers are as specified in the Lighting Fixture Schedule.

1.5 SUBMITTALS

A. Pre-Bid.

1. Substitutions.

a. Requests for fixture and lamp substitutions shall be made no less than ten (10) business days prior to bid due date. No requests for substitutions shall be considered after this time. Requests for substitutions shall be submitted in accordance with the requirements of this Section.

b. Specified products are known to be available at the time of construction. Should the Contractor discover that any equipment may be unavailable, it is the Contractor’s responsibility to notify the Architect not less than ten (10) business days prior to bid.

c. Owner Directed Changes. If the Owner directs the Contractor to submit alternate fixtures for the purpose of reducing the costs, substitutions shall meet or exceed the quality and capabilities of the specified equipment. Such requests for

substitutions shall be submitted in accordance with the requirements of this Section.

d. If a proposed substitute fails to comply with the Specification requirements, the Contractor shall furnish the acceptable fixture at no additional cost to the Owner, and with no delay to the project.

B. With Bid.

1. All deviations and exceptions from this Specification must be revealed with bid. Deviations and exceptions from the Specification submitted after this time shall not be accepted, whether or not these variations have been formally or informally accepted by the Architect or Lighting Consultant.

2. For third-party lighting fixtures integrated into custom or refurbished fixtures, Manufacturers' catalog numbers listed in the lighting fixture schedule are included to aid in fixture identification. These numbers are subject to periodic change by manufacturers and therefore need to be used in conjunction with the fixture descriptions. Incomplete or obsolete catalog numbers do not indemnify the Contractor from providing equipment as described in the lighting fixture schedule and in this Specification.

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1. Complete description of all proposed cleaning, manufacturing, and/or assembly techniques and materials for the fabrication and/or restoration work.

2. Dimensioned fixture plans, elevations, and sections.

3. Itemized list and specifications of all third-party lamps and accessories that are part of the overall fixture.

4. Indicate overall fixture weight, materials, methods, finishes and types of joinery, fasteners, anchorages, and accessory items. Specify all finishes.

5. Setting diagrams and templates for anchorages, sleeves and bolts.

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7. Indication of fixture mounting conditions and trim type.

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3. Notify the Architect and Lighting Consultant at least 5 business days in advance of the prototype completion date in order to schedule the prototype review session.
4. Prototypes may be included in the total fixture quantity required for the project if they meet all requirements of this Section, the project documentation, and is approved by the Lighting Consultant and Architect.
5. Prototypes shall be accessible for complete review.
6. Prototypes shall be installed in a dark room where other light sources can be separately controlled and blackout shades are provided to control daylight. Manufacturer shall be prepared to perform nighttime review if darkened room is unavailable.

7. Manufacturer shall prepare revised prototypes as requested by the Lighting Consultant and/or Architect until all requirements of this Section and the project documentation are met, and the prototype has been reviewed and approved by the Lighting Consultant and Architect. Multiple revisions may be required.

8. When accepted, prototypes shall serve as the standard for materials, workmanship, and appearance for such work throughout the project.

F. Final submittal. As a condition for final approval, the Contractor shall submit to the Architect and Owner within one (1) month of completion of the project:

1. Five (5) sets of "As built and approved" drawings showing all systems and components as installed, including all field modifications.

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c. Manufacturer names and their contact information.

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1.6 FINAL REVIEW

A. Upon completion of installation work, the Contractor shall certify in writing that the work is complete and ready for final review.

B. The final review shall be conducted by the Owner, Architect, and Lighting Consultant within fourteen (14) days of the Contractor's notice of completion.

1.7 GENERAL REQUIREMENTS

A. General Conditions of the project contract, work schedules, and site regulations apply to this work.

B. This work shall comply with applicable local codes and the NEC. Fixtures shall carry labels of a Nationally Recognized Testing Laboratory (NRTL), such as UL or ETL.

C. Warranty.

1. The Contractor shall unconditionally warrant all equipment and systems provided under this Section to be free from defects in materials and workmanship for a period of at least twelve (12) months from the date of final acceptance of all work of this Section. Replacement of faulty materials and the cost of labor required for the replacement shall be the responsibility of the Contractor. Lamps and normal wear and tear are exempted.

2. Warranty service shall be performed by personnel in the employ of the Contractor and shall not be sub-contracted or assigned to another company, service, or individual unless the Owner has approved such assignment in writing, in which event the Contractor shall nevertheless be responsible to the Owner for such work.

D. Special Warranty.

1. Unconditionally warrant all finishes provided under this Section to be free from noticeable changes such as corrosion, oxidation, fading, chipping, and yellowing for a period of five (5) years from the date of final acceptance of all work of this Section. Replacement of

faulty materials and the cost of labor required for the replacement shall be the responsibility of the Contractor.

2. Unconditionally warrant all lenses provided under this Section to be free from noticeable changes such as fading, chipping, and yellowing for a period of five (5) years from the date of final acceptance of all work of this Section. Replacement of faulty materials and the cost of labor required for the replacement shall be the responsibility of the Contractor.

3. LED Fixtures.

   a. Fixture Manufacturer shall provide a minimum 5-year warranty for all components.

   b. Replacement components shall match all of the performance characteristics of the originally-installed fixtures and LEDs.

   c. Replacement components shall be fully compatible with the original components.

PART 2 - PRODUCTS

2.1 GENERAL

A. Refer to specification Section 265010, “Lighting Fixtures, Lamps, & Drivers.”

2.2 LAMPS

A. Refer to specification Section 265010, “Lighting Fixtures, Lamps, & Drivers.”

2.3 FIXTURES – GENERAL

A. Refer to specification Section 265010, “Lighting Fixtures, Lamps, & Drivers.”

B. Appropriate cleaning solution(s) shall be used to ensure that existing finishes are protected.

C. Minimize visibility of exposed hardware.

D. Lamp Mounting and Positioning.

1. Lamps shall be fully accessible without disassembling fixture components or removing fixture from mounting location.

2. When backlighting a translucent material, lamps shall be positioned at the proper orientation and distance from its surface to maximize the lighting uniformity.

3. Lamps shall be positioned at the proper orientation and distance from all surfaces so as to prevent deformation, melting, or combustion of materials.

4. Sockets shall be positioned so as to orient the lamp in the burning position recommended by the lamp manufacturer.

2.4 MATERIALS

A. Materials shall be as indicated in the Drawings, Fixture Cutsheets, and in this Specification.

B. Where not noted, finishes shall be as selected by the Architect.

C. Brackets and supplementary supporting members required to mount lighting fixtures shall be furnished as part of the work of this Section.

D. Welding Electrodes and Filler Material.

1. Electrodes and filler material shall comply with the AWS standards and shall be selected for the type and alloy of metal to be welded, and as required for color match, strength and compatibility.
2. Weld connections shall comply with AWS standards for procedures, appearance, quality of welds and methods used for correcting welded work.
3. Weld connections shall comply with AISC standards for bearing, adequacy of temporary connections, alignment and removal of paint on adjacent surfaces.
4. Verify that weld size, fabrication sequence, and equipment used will limit distortions to allowable tolerances. Prevent surface bleeding of backside welding on exposed surfaces. Grind smooth fillet welds ½ in and larger, and grind flush butt welds. Dress exposed welds.
5. Welds shall be continuous unless specifically approved otherwise by Architect and Lighting Consultant. Welds shall be located and completed so as to present a smooth and unbroken appearance on visual examination of the fixture housing.

E. Finishes.

1. Paints, coatings, and other finishes shall be selected on the basis of color, finish, durability, compatibility with base material, and resistance to heat, corrosion, and other environmental elements.
2. Individual components shall be painted separately prior to assembly of the overall fixture, unless specifically approved by the Architect or Lighting Consultant.
3. Paints, coatings, and other finishes shall be applied so as to achieve a uniform appearance that is devoid of spots, streaks, and imperfections, and is consistent among all fixtures of its type.
4. Fixtures shall have a clear protective finish for maximum resistance to corrosion. Fixture's final appearance shall match finish sample approved by Architect and Lighting Consultant.

F. Fasteners.

1. Wherever feasible, re-use existing fasteners.
2. Fasteners shall be constructed of basic metal and alloy, and shall match the finished color and texture of the metal being fastened, unless otherwise indicated.
3. Where feasible, provide captive screws for all access panels required for servicing lamps and ballasts.
4. Exposed screws shall be Phillips flat-head, unless noted otherwise.
5. Captive screws shall be stainless steel and shall have undercut threads in order to retain position of screw without the use of rubber. Where extruded aluminum is used for housing material, stainless steel threaded inserts shall be used.
6. Conceal fasteners wherever possible. All screws, rivets, and clips used for fastening components shall be located and installed so as to present a smooth and unbroken appearance upon visual examination of external section of the fixture housing.

G. Corrosion Resistance.

1. Manufacturer shall verify that each fixture and its components are suitable for the potential for corrosion of the respective mounting environment.

2. Paint shall have corrosion resistant properties and shall be applied in a smooth, even application to seal the metal off from atmospheric oxygen and moisture.
3. Prepare surfaces adequately prior to the application of any protective coating system or corrosion inhibitor.
4. Care shall be taken when mixing metals. Components shall be made of metals of compatible galvanic series. Where required, an appropriate barrier shall be provided between dissimilar metals.
5. When joining surfaces, care shall be taken to avoid crevices.
6. Ensure that metal parts have a sacrificial coating or barrier coating before they are bolted or clamped together.
7. When bending metals, a generous bending radius shall be used to minimize the creation of internal tensile stresses.
8. When washing components made of dissimilar metals, de-ionized water shall be used and they shall be dried quickly and thoroughly.

H. Anchors and inserts shall be provided where required for the installation of ornamental fixture items. Provide toothed steel or lead shield expansion bolt devices for drilled-in-place anchors. Provide galvanized or cadmium-coated anchors and inserts for exterior installation.

I. Suspension mechanism.

1. Method of suspension shall be as shown in the Drawings and shall be designed and engineered by the Manufacturer to support the full weight of the fixture, including lamps, ballasts / transformers, and accessories, using a minimum safety factor of 2:1.
2. Suspension mechanisms shall be designed and engineered by the Manufacturer to assure that the fixture remains level and in balance.
3. If indicated in the Drawings, suspension mechanism shall be designed and engineered by the Manufacturer to prevent rotation after installation.
4. If indicated in the Drawings, Manufacturer shall coordinate suspension mechanism with the specified winch system.
5. Electrical feed shall be as shown in the Drawings, and shall be routed through suspension mechanism in compliance with NRTL approved methods. Power cord finish shall match finish of suspension hardware.

J. Cutting, Stamping, and Punching.

1. Material cutting shall match patterns shown in the Drawings.
2. Patterns shall be consistent from fixture to fixture.
3. Care shall be taken to eliminate all burrs and sharp edges.
4. Finished panels shall maintain their rigidity.

K. Castings.

1. Castings shall match existing fixture castings.
2. Castings shall be consistent from fixture to fixture.
3. Care shall be taken to eliminate all burrs and sharp edges.
4. Minimize visibility and size of all seams between castings.
5. Copper alloy castings shall meet the requirements of ASTM B824-04.

6. Aluminum alloy sand castings shall meet the requirements of ASTM B 26
7. Aluminum alloy die castings shall meet the requirements of ASTM B85-03
8. Gray Iron castings shall meet the requirements of ASTM A48, Class 30.
9. Malleable Iron castings shall meet the requirements of ASTM A47, Grade 32510.

L. Glass Shades.

1. Lenses / panels shall be:
   a. Resistant to heat from adjacent lamps and electrical components / tempered
   b. Consistent from shade to shade
   c. Free of burrs, sharp edges, chips, cracks, bubbles, etc.
   d. Low iron content to prevent green color shift
   e. Minimum thickness: 3/16 in.
   f. 50%+ transmissive
   g. UV stable
   h. Fritted / frosted / etched / sandblasted / textured as specified
   i. Color fast to prevent fading over time
   j. Matched to existing shades and/or photos provided by design team
2. Provide attic stock of glass shades. Quantities shall be equal to and not less than 10 percent for the glass shade quantity of each fixture type, and in no case shall quantities be less than 2 per fixture type. Deliver fixture to Owner wrapped and sealed in polyethylene and substantially crated for shipment. Containers shall clearly indicate equipment contained.

2.5 PATTERNS AND FILTERS

A. Refer to specification Section 26 50 10, “Lighting Fixtures, Lamps, & Drivers.”

2.6 ELECTRICAL COMPONENTS

A. Refer to specification Section 26 50 10, “Lighting Fixtures, Lamps, & Drivers.”

2.7 LED DRIVERS AND TRANSFORMERS

A. Refer to specification Section 26 50 10, “Lighting Fixtures, Lamps, & Drivers.”

B. If required, driver/ballast/transformer enclosures shall be designed to allow devices to operate within their operating temperature range as recommended by the device manufacturer.

C. Driver/ballast/transformer locations as shown in the Drawings.

2.8 MOUNTING SYSTEMS

A. The following requirements refer to canopies, mounting plates, mounting arms, stems, chains, cables, and associated hardware required to support the fixtures.

B. Manufacturer shall provide all required mounting system components as part of the work of this Section, including fasteners, safety cables, anchors, etc.

C. Mounting system components and associated hardware shall be designed and fabricated to support entire weight of fixture and components.

D. Safety cables shall be concealed within fixture stems.

E. Chains shall be designed to prevent spinning of fixture and maintain fixture orientation.

F. Suspension and safety cables shall be selected using a minimum safety factor of 3:1.

G. Suspension chains shall be welded link and shall be selected using a minimum safety factor of 3:1.

H. Wherever possible, Manufacturer shall minimize the appearance of exposed fasteners.

I. Finish: TBD

J. Mounting system components shall be as shown in the Drawings.

2.9 MOUNTING HARDWARE

A. Refer to specification Section 26 50 10, “Lighting Fixtures, Lamps, & Drivers.”

PART 3 - EXECUTION

3.1 REMOVAL AND HANDLING

A. Label each fixture to identify its existing location.

B. Disconnect and remove fixtures.

C. Carefully disassemble fixtures if required for shipment. Label each fixture part to facilitate accurate re-assembly.

D. Package and transport fixtures so that they arrive at the Manufacturer’s facility in the same condition as when removed from the site.

3.2 FABRICATION

A. Clean, refurbish, and refinish fixtures as shown in the Drawings, Fixture Cutsheets, and Lighting Fixture Schedule.

B. Re-wire / replace existing fixture components and re-lamp as shown in the Drawings, Fixture Cutsheets, and Lighting Fixture Schedule.

C. Incorporate new lighting components within existing fixtures as shown in the Drawings, Fixture Cutsheets, and Lighting Fixture Schedule.

D. Electrical wiring.

1. Internal wiring shall be completed by factory. All wiring shall be in harnesses and bound. No loose or randomly routed wires shall be permitted.
2. Conductors shall be routed to avoid obstructing or shadowing of light on reflectors and lenses.

3. Unless otherwise shown in the Drawings, conductors shall be completely concealed.
4. Exposed conductors shall be routed as shown in the Drawings. Finish per Architect.
5. Wire sizes and insulations shall comply with NEC, UL, and local codes and meet or exceed electronics industry standards.

E. For fixtures requiring assembly at the site, all parts shall be carefully labeled to facilitate the re-assembly. Provide drawing indicating part numbers and assembly sequence.

3.3 PACKING AND SHIPPING

A. Equipment shall be wrapped, sealed, and substantially crated for shipment. Crates shall clearly indicate equipment contained.

B. Deliver and store materials in Manufacturer's original packaging labeled to show project name, project fixture type, Manufacturer name, and model number.

C. Store materials in protected, dry, elevated location and in accordance with Manufacturer's instructions. Do not open packaging or remove labels until time for installation.

D. Provide sufficient insurance coverage to cover the cost of fabricating a replica(s) of the original lighting fixtures, if needed, should any of the original fixtures be damaged, stolen, or lost while they are packaged and transported.

3.4 INSTALLATION

A. Refer to specification Section 26 50 10, "Lighting Fixtures, Lamps, & Drivers."

B. Re-install fixture / elements of fixture in the original locations

C. Where indicated in the Drawings, install pendant in correct orientation**.**

3.5 FIXTURE FOCUSING AND ADJUSTMENT

A. Refer to specification Section 26 50 10, "Lighting Fixtures, Lamps, & Drivers."

END OF SECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Communications system design requirements.

B. Communications pathways.

C. Copper cable and terminations.

D. Fiber optic cable and interconnecting devices.

E. Communications equipment room fittings.

F. Communications outlets.

G. Communications grounding and bonding.

H. Communications identification.

I. Horizontal network cabling for staff and patron computers, printers, wireless access points, and other data devices indicated on the drawings, including terminations, testing, and certification.

1.02 RELATED REQUIREMENTS

A. Section 260526 - Grounding and Bonding for Electrical Systems.
   1. Includes intersystem bonding termination.
   2. Includes bonding jumpers for bonding of communications systems and electrical system grounding.

B. Section 260533.16 - Boxes for Electrical Systems.

C. Section 260553 - Identification for Electrical Systems: Identification products.

D. Section 262726 - Wiring Devices.

E. Section 270533.13 - Conduit for Communications Systems.

1.03 REFERENCE STANDARDS

A. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition; 2019.

B. EIA/ECA-310 - Cabinets, Racks, Panels, and Associated Equipment; 2005e.

C. ICEA S-83-596 - Indoor Optical Fiber Cable; 2021.

D. ICEA S-90-661 - Category 3 and 5E Individually Unshielded Twisted Pairs, Indoor Cables (With or Without an Overall Shield) for Use in General Purpose and LAN Communication Wiring Systems; 2021.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. TIA-455-21 - FOTP-21 - Mating Durability of Fiber Optic Interconnecting Devices; 1988a (Reaffirmed 2012).

G. TIA-492AAAB - Detail Specification for 50-um Core Diameter/125-um Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers; 2009a.

H. TIA-492AAAC - Detail Specification for 850-nm Laser-Optimized, 50-um Core Diameter/125-um Cladding Diameter Class Ia Graded-Index Multimode Optical Fibers; 2009b.

I. TIA-526-7 - Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant, Adoption of IEC 61280-4-2 Edition 2: Fibre-Optic Communications Subsystem Test Procedures – Part 4-2: Installed Cable Plant – Single-Mode Attenuation and Optical Return Loss Measurement; 2015a (Reaffirmed 2022).

J. TIA-526-14 - Optical Power Loss Measurement of Installed Multimode Fiber Cable Plant; IEC 61280-4.1 Edition 3.1, Fiber Optic Communications Subsystem Test Procedures- Part 4-1: Installed Cable Plant- Multimode Attenuation Measurement; 2023d.

K. TIA-568 (SET) - Commercial Building Telecommunications Cabling Standard Set; 2024.

L. TIA-568.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standards; 2018d, with Addenda (2020).

M. TIA-568.3 - Optical Fiber Cabling and Components Standard; 2022e.

N. TIA-569 - Telecommunications Pathways and Spaces; 2019e, with Addendum (2022).

O. TIA-598 - Optical Fiber Cable Color Coding; 2014d, with Addendum (2018).

P. TIA-606 - Administration Standard for Telecommunications Infrastructure; 2021d.

Q. TIA-607 - Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises; 2019d, with Addendum (2021).

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

S. UL 444 - Communications Cables; Current Edition, Including All Revisions.

T. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.

U. UL 1651 - Fiber Optic Cable; Current Edition, Including All Revisions.

V. UL 1863 - Communications-Circuit Accessories; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate requirements for service entrance and entrance facilities with Communications Service Provider.
   2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for communications equipment.
   3. Coordinate arrangement of communications equipment with the dimensions and clearance requirements of the actual equipment to be installed.
   4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Arrange for Communications Service Provider to provide service.

C. Preinstallation Meeting: Convene one week prior to commencing work of this section to review service requirements and details with Communications Service Provider representative.

1.05 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.

C. Shop Drawings: Show compliance with requirements on isometric schematic diagram of network layout, showing cable routings, telecommunication closets, rack and enclosure layouts and locations, service entrance, and grounding, prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).

D. Evidence of qualifications for installer.

E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and operation of product.

F. Test Plan: Complete and detailed plan, with list of test equipment, procedures for inspection and testing, and intended test date; submit at least 60 days prior to intended test date.

G. Field Test Reports.

H. Project Record Documents: Prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).
   1. Record actual locations of outlet boxes and distribution frames.

2. Show as-installed color coding, pair assignment, polarization, and cross-connect layout.
3. Identify distribution frames and equipment rooms by room number on drawings.

I. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of project record documents.

1.06 QUALITY ASSURANCE

A. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

B. Manufacturer Qualifications: At least 3 years experience manufacturing products of the type specified.

C. Installer Qualifications: A company having at least 3 years experience in the installation and testing of the type of system specified, and:
1. Employing a BICSI Registered Communications Distribution Designer (RCDD).
2. Supervisors and installers factory certified by manufacturers of products to be installed.
3. Employing BICSI Registered Cabling Installation Technicians (RCIT) for supervision of all work.

D. Products: Listed, classified, and labeled as suitable for the purpose intended.

1.07 DELIVERY, STORAGE, AND HANDLING

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

B. Keep stored products clean and dry.

1.08 WARRANTY

A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a 2 year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 SYSTEM DESIGN

A. Provide a complete permanent system of cabling and pathways for voice and data communications, including cables, conduits and wireways, pull wires, support structures, enclosures and cabinets, and outlets.
1. Comply with TIA-568 (SET) (cabling) and TIA-569 (pathways) (commercial standards).
2. Comply with Communications Service Provider requirements.
3. Provide fixed cables and pathways that comply with NFPA 70 and TIA-607 and are UL listed or third party independent testing laboratory certified.
4. Provide connection devices that are rated for operation under conditions of 32 to 140 degrees F (0 to 60 degrees C) at relative humidity of 0 to 95 percent, noncondensing.
5. In this project, the term plenum is defined as return air spaces above ceilings, inside ducts, under raised floors, and other air-handling spaces.

B. System Description:
1. Building Entrance Cable: By others.
2. Backbones - Within Building: Fiber optic, MM OM4 -fiber.
3. Offices and Work Areas: Provide voice and data outlets in quantities indicated on the drawings.
4. Horizontal Network Cabling: Provide new data cabling for staff and patron computers, printers, wireless access points, and other network devices as indicated on the drawings. Coordinate cable quantities and outlet requirements with Owner's IT representative.
5. Network Connections: Provide complete cabling connections from each new data outlet to the designated telecommunications distribution frame (MDF/IDF), including cables, connectors, jacks, patch panel terminations, and associated accessories.

C. Main Distribution Frame (MDF): Centrally located support structure for terminating horizontal cables that extend to telecommunications outlets, functioning as point of presence to external service provider.
   1. Locate main distribution frame as indicated on the drawings.
   2. Capacity: As required to terminate all cables required by design criteria plus minimum 25 percent spare space.

D. Intermediate Distribution Frames (IDF): Support structures for terminating horizontal cables that extend to telecommunications outlets.
   1. Locate intermediate distribution frames as indicated on the drawings.

E. Backbone Cabling: Cabling, pathways, and terminal hardware connecting intermediate distribution frames (IDF's) with main distribution frame (MDF), wired in star topology with main distribution frame at center hub of star.

F. Cabling to Outlets: Specified horizontal cabling, wired in star topology to distribution frame located at center hub of star; also referred to as "links".

2.02 PATHWAYS

A. Conduit: See section 270533.13.

B. Overhead Service Entrance: Weatherhead or service entrance fitting located on outside of building with galvanized rigid steel or intermediate metallic conduit running to entrance facility.

C. Underground Service Entrance: Rigid polyvinyl chloride (PVC) conduit, Schedule 40.

D. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

2.03 COPPER CABLE AND TERMINATIONS

A. Copper Horizontal Cable:
   1. Description: 100 ohm, balanced twisted pair cable complying with TIA-568.2 and listed and labeled as complying with UL 444.
   2. Cable Type - Voice and Data: TIA-568.2 Category 6 UTP (unshielded twisted pair); 23 AWG for Standard Data Outlets.
   3. Cable Type - Voice and Data: TIA-568.2Category 6A UTP (unshielded twisted pair); 4-pair for Wireless Access Point (WAP) Outlets.
   4. Cable Capacity: 4-pair.
   5. Cable Applications: Use listed NFPA 70 Type CMP plenum cable unless otherwise indicated.
   6. Cable Jacket Color - Voice and Data Cable: Blue.
   7. Product(s):
      a. Panduit TX6 Category 6 U/UTP Copper Cable - standard outlets.
      b. Panduit TX6A Category 6A U/UTP Copper Cable - WAP outlets.

B. Copper Cable Terminations: Insulation displacement connection (IDC) type using appropriate tool; use screw connections only where specifically indicated.

C. Jacks and Connectors: Modular RJ-45, non-keyed, terminated with 110-style insulation displacement connectors (IDC); high impact thermoplastic housing; suitable for and complying with same standard as specified horizontal cable; UL 1863 listed.
   1. Performance: 500 mating cycles.
   2. Voice and Data Jacks: 8-position modular jack, color-coded for both T568A and T568B wiring configurations.
   3. Product(s):
      a. Panduit: NetKey RJ45 Jack: NK6 Series Category 6 U/UTP Modular Jacks.
      b. Panduit: NetKey RJ45 Jack: NK6X Series Category 6A U/UTP Modular Jacks.

D. Copper Patch Cords:

1. Description: Factory-fabricated 4-pair cable assemblies with 8-position modular connectors terminated at each end.
2. Patch Cords for Patch Panels:
   a. Quantity: One for each pair of patch panel ports.
   b. Length: as required.
3. Patch Cords for Work Areas:
   a. Quantity: One for each work area outlet port.
   b. Length: 6 feet or as directed by Owner.
4. Product(s):
   a. Panduit TX6 Category 6 U/UTP Patch Cords.
   b. Panduit TX6X Category 6A U/UTP Patch Cords.

2.04 COMMUNICATIONS OUTLETS

A. Manufacturers:
   1. Panduit Netkey.

B. Outlet Boxes: Comply with Section 260533.16.
   1. Provide depth as required to accommodate cable manufacturer's recommended minimum conductor bend radius.
   2. Minimum Size, Unless Otherwise Indicated:
      a. Voice Only Outlets: 4 inch by 2 inch by 2-1/8 inch deep (100 by 50 by 54 mm) trade size.
      b. Fiber Optic Outlets: 4-11/16 inch square by 2-1/8 inch deep (119 by 54 mm) trade size.

C. Wall Plates:
   1. Comply with system design standards and UL 514C.
   2. Accepts modular jacks/inserts.
   3. Capacity:
      a. Data or Combination Voice/Data Outlets: 2 ports.
   4. Wall Plate Material/Finish - Flush-Mounted Outlets: High impact thermoplastic, color to be selected.
   5. Product(s):
      a. Panduit NetKey.

2.05 GROUNDING AND BONDING COMPONENTS

A. Comply with TIA-607.

2.06 IDENTIFICATION PRODUCTS

A. Comply with TIA-606.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

A. Comply with latest editions and addenda of TIA-568 (SET) (cabling), TIA-569 (pathways), TIA-607 (grounding and bonding), BICSI N1, NFPA 70, and SYSTEM DESIGN as specified in PART 2.

B. Comply with Communication Service Provider requirements.

C. Grounding and Bonding: Perform in accordance with TIA-607 and NFPA 70.

3.02 INSTALLATION OF PATHWAYS

A. Install pathways with the following minimum clearances:
   1. 48 inches (1220 mm) from motors, generators, frequency converters, transformers, x-ray equipment, and uninterruptible power systems.
   2. 12 inches (300 mm) from power conduits and cables and panelboards.
   3. 5 inches (125 mm) from LED, fluorescent and high frequency lighting fixtures.

4. 6 inches (150 mm) from flues, hot water pipes, and steam pipes.

B. Outlet Boxes:
1. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of telecommunications outlets provided under this section.
   a. Mounting Heights: As indicated on the drawings.
   b. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
   c. Provide minimum of 24 inches (600 mm) horizontal separation between flush mounted outlet boxes installed on opposite sides of fire rated walls.
   d. Unless otherwise indicated, provide separate outlet boxes for line voltage and low voltage devices.
   e. Locate outlet boxes so that wall plate does not span different building finishes.
   f. Locate outlet boxes so that wall plate does not cross masonry joints.

3.03 INSTALLATION OF EQUIPMENT AND CABLING

A. Cabling:
1. Do not bend cable at radius less than manufacturer's recommended bend radius; for unshielded twisted pair use bend radius of not less than 4 times cable diameter.
2. Do not over-cinch or crush cables.
3. Do not exceed manufacturer's recommended cable pull tension.
4. When installing in conduit, use only lubricants approved by cable manufacturer and do not chafe or damage outer jacket.

B. Service Loops (Slack or Excess Length): Provide the following minimum extra length of cable, looped neatly:
1. At Distribution Frames: 120 inches (3000 mm).
2. At Outlets - Copper: 12 inches (305 mm).
3. At Outlets - Optical Fiber: 39 inches (1000 mm).

C. Copper Cabling:
1. Category 5e and Above: Maintain cable geometry; do not untwist more than 1/2 inch (12 mm) from point of termination.
2. For 4-pair cables in conduit, do not exceed 25 pounds (110 N) pull tension.
3. Use T568B wiring configuration.
4. Continuous Cable Runs: Provide continuous, unspliced horizontal cable runs from each telecommunications outlet or wireless access point location to the designated patch panel in the assigned IDF Closet. Splices, intermediate couplers, and intermediate cable connections are not permitted.
5. Cable Terminations: Terminate each horizontal cable at the associated telecommunications outlet and designated patch panel port. Coordinate patch panel assignments and termination locations with Owner's IT representative prior to installation.
6. Network Connections: Coordinate final connections to Owner's network equipment with Owner's IT representative. Provide patch cords as specified under Section 2.03(D). Configuration and programming of active network equipment shall be by Owner unless otherwise indicated.

D. Fiber Optic Cabling:
1. Prepare for pulling by cutting outer jacket for 10 inches (250 mm) from end, leaving strength members exposed. Twist strength members together and attach to pulling eye.
2. Support vertical cable at intervals as recommended by manufacturer.

E. Wall-Mounted Racks and Enclosures:
1. Install to plywood backboards only, unless otherwise indicated.
2. Mount so height of topmost panel does not exceed 78 inches (1980 mm) above floor.

F. Floor-Mounted Racks and Enclosures: Permanently anchor to floor in accordance with manufacturer's recommendations.

G. Identification:
   1. Use wire and cable markers to identify cables at each end.
   2. Use manufacturer-furnished label inserts, identification labels, or engraved wallplate to identify each jack at communications outlets with unique identifier.
   3. Use identification nameplate to identify cross-connection equipment, equipment racks, and cabinets.
   4. Cable Identification: Provide permanent, machine-generated identification for each new horizontal cable, telecommunications outlet, and associated patch panel port. Use matching unique identifiers at both ends of each cable, consistent with Owner's existing labeling conventions and TIA-606 requirements.

3.04 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

B. Comply with inspection and testing requirements of specified installation standards.

C. Visual Inspection:
   1. Inspect cable jackets for certification markings.
   2. Inspect cable terminations for color coded labels of proper type.
   3. Inspect outlet plates and patch panels for complete labels.

D. Testing - Copper Cabling and Associated Equipment:
   1. Test backbone cables after termination but before cross-connection.
   2. Test backbone cables for DC loop resistance, shorts, opens, intermittent faults, and polarity between connectors and between conductors and shield, if cable has overall shield.
   3. Test operation of shorting bars in connection blocks.
   4. Category 5e and Above Links: Perform tests for wire map, length, attenuation, NEXT, and propagation delay.
   5. Horizontal Cable Certification: Perform 100 percent certification testing of all new copper horizontal cabling links using a calibrated field certification tester suitable for the specified Category 6 or Category 6A cabling system. Test each link in the permanent-link configuration in accordance with applicable TIA-568 requirements.
   6. Test Acceptance: All installed links shall achieve passing results for the specified cabling category. Repair or replace deficient cabling and retest until compliant. Continuity or wire-map testing alone is not acceptable.
   7. Test Reports: Submit electronic certification test reports for each installed link, including unique cable identification, test date, test equipment identification, measured performance results, and pass/fail status. Reports shall correspond to final as-built cable identification and patch panel port assignments.

E. Final Testing: After all work is complete, including installation of telecommunications outlets, and telephone dial tone service is active, test each voice jack for dial tone.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including general and supplementary conditions and Division 1 specification sections, apply to this section.

1. This section does not include all of the general project requirements or other relevant details related to bidding instructions and/or scope. Refer to the Request for Proposal and other front-end documents for complete instructions.

B. Related sections include the following:

1. Division 26 – Electrical

2. Division 11 – Equipment – Rigging

1.2 PROJECT TEAM

A. AV Consultant:
Company Name: Threshold Acoustics
Contact Name: Marc Goossens
Contact Email: mgoossens@threshold.llc
Contact Phone: (312)386-1400

B. Owner: Lake Forest Library

C. Architect: Vinci Hamp Architects

1.3 BIDDER QUALIFICATIONS

A. The installation of the Audio-Video systems requires the experience and skills of a specialty contractor.

1. Only bidders who have been qualified by the consultant and client shall be permitted to bid.

2. The contractors listed below have the required qualifications and have been approved to bid:

a. Company Name: Pentegra Systems, LLC
Contact Name: Bruce Berenschot
Contact Email: bberenschot@pentegrasystems.com
Contact Phone: 630-941-6000

b. Company Name: Diversified Systems
Contact Name: Ryan O'Halloran
Contact Email: rohalloran@diversifiedus.com
Contact Phone: 630-442-3792

c. Company Name: Sound Planning
Contact Name: Erik Saari
Contact Email: esaari@soundplanning.com
Contact Phone: 847-274-6897

d. Company Name: TMG Systems, Inc.
Contact Name: Steve Johnson
Contact Email: steve.johnson@tmgsystems.net
Contact Phone: 815-266-6002

e. Company Name: OSA
Contact Name: Justin Heath
Contact Email: jheath@osacorp.com
Contact Phone: 888-672-2210

f. Company Name: Advanced Communications
Contact Name: Tim Eldridge
Contact Email: teldridge@advancedcom.biz
Contact Phone: 219-874-3333

B. Only bid proposals from qualified bidders will be accepted.

C. The following outlines the criteria used to determine the qualifications of the bidder, at the discretion of the owner and consultant.

1. Each bidder shall be recognized in the industry as an Audio-Video systems contractor and actively engaged in the engineering, installation, and maintenance of professional Audio-Video systems for cultural facilities.

2. Each bidder shall be capable of providing the operational, technical, and financial resources required to complete a project of this size and scope.

3. Each bidder shall have at least five years of experience in the engineering, installation, testing and maintenance of Audio-Video systems for cultural facilities.

4. Each bidder must maintain facilities, equipment inventory, and trained technicians for fabricating, testing, rigging, installing, and servicing the equipment specified herein.

5. Each bidder must hold current certifications from all manufacturers requiring certification to procure, install, program, and otherwise support their equipment.

6. Each bidder should participate in continuing technical training in the Audio Engineering Society (AES), Professional Lighting and Sound Association (PLASA), National Systems Contractors Association (NSCA), and/or AVIXA.

D. The qualification submittal package shall include a minimum of the following items:

1. A company overview including the markets served and the number of years in business as an Audio-Video systems contractor serving the cultural or educational market.

2. A legal description of the company including corporate name, date of incorporation, corporate officers, mailing address, and shipping address.

3. List of three similar cultural facility projects completed in the last five (5) years including contract amount, and references. Include as references the client, architect, Audio-Video consultant, and general contractor where applicable.

a. At least one of these prior projects must have been completed through a Design-Bid-Build process.

4. Description of the size and capabilities of the shop and warehousing facility.

5. A list of all full-time employees and their current title and responsibilities. Provide a résumé for each of the key individuals that would be assigned to this project including sales, engineering, project manager, and site foreman.

6. A complete set of approved shop drawings from one of the reference projects submitted in response to item 3 above.

7. An example of client training presentations or training documentation from one of the reference projects submitted in response to item 3 above.

8. A complete set of approved as-built drawings from one of the reference projects submitted in response to item 3 above.

9. A list of professional affiliations and memberships.

10. A list of equipment dealerships.

1.4 SCOPE OF SPECIFICATION

A. This specification describes the various Audio-Video systems associated with the Lake Forest Library Historic Rooms. The intent of the specification is for the Audio-Video systems contractor to provide a professionally installed system that is complete, tested, and ready to use.

B. This project manual and drawings set (AV-001 to AV-701, comprising 15 total sheets) and any addenda constitute the contract documents.

1.5 CONTRACTOR RESPONSIBILITY

A. The specification is detailed only to the extent to show design intent and signal flow. Areas within the specification will require further engineering, equipment, and coordination with other trades to complete a fully functioning Audio-Video system. The Audio-Video contractor understands and accepts that the work described in the specification shall be complete in every detail as necessary to supply a professional working system.

B. Equipment and parts not mentioned in the Major Equipment List or identified on the drawings but required to complete a professionally installed and working system shall be provided without request for additional monies or services.

1. Where additional engineering or design is required to establish a complete bill of materials for the system installation, the AV contractor shall determine the required materials and furnish them.

1.6 SYSTEM DESCRIPTION

A. The renovated Lake Forest Library Historic Rooms are used daily by members of the community, from typical daily use to occasional community events, performances, and presentations. The audio systems are intended to provide speech. Video presentation systems will be used to display presentation content to audiences and participants.

1. Cable infrastructure:

a. The only AV connection is provided (see AV termination schedule) in a floor box enclosure at the presentation area near the fireplace in the Reading Room. This connection will run back to the ceiling speakers in the Reading Room and take input from the rack housed within the portable lectern.

2. Audio Systems:

a. Loudspeaker Systems

The main loudspeaker consists of the following:

1). (3) Full-Range, ceiling-mount loudspeakers in the Reading Room.

2). Dante-enabled amplifiers to power all installed loudspeaker elements.

b. Input Sources:

a). A selection of wired and wireless microphones and accessories are to be provided (see spec).

b). BYOD laptop connection will be provided at the portable lectern

c. Ancillary Systems:

a). An RF hearing assistance system is to be provided to support audience members with hearing limitations.

d. Video Systems:

1). Presentation Video System:

a). Presentation content is to be displayed on a portable 75” monitor mounted to a rolling stand.

b). Routing/distribution of presentation video content is achieved through AVoIP to allow the display to be positioned and connected at any of the IT outlets throughout the library.

c). Input to the presentation video system is provided through a wall-plate form-factor AVoIP encoder located on the portable lectern.

d). Audio from video content is to be routed to the DSP and the amplifier.

2). AV Control System:

a). Anticipated functionality of the AV control system includes the following:

i. Audio System Power

ii. Portable Video Display Power

iii. Control of Audio Level from Wired and Wireless Mics and Audio from Video sources

1.7 SCOPE OF WORK

A. Furnish all equipment, materials, cable, labor, and engineering services to provide complete and professionally installed systems in working order and in accordance with good engineering practice.

B. Coordinate with other trades.

1. Coordinate with the Electrical Contractor to ensure correct audio and video raceway routing, audio and video back box locations, and clean technical power circuit locations as specified in Division 26 – Electrical.

2. Coordinate with General Contractor to ensure all structural rigging points and backing required to install and deploy Audio-Video equipment is provided and positioned correctly.

a. The Audio-Video Systems Contractor shall coordinate requirements with General Contractor.

3. Coordinate with IT designer and/or the owner’s IT staff or representative to ensure the necessary accommodations are made related to the facility networks and internet (e.g. VLAN requirements, network topology, security, et al.)

4. Coordinate with other trades as required to ensure timely progress and successful integration of the Audio-Video systems.

C. Install, pull, and terminate all wire and cable in the raceway system provided by the electrical contractor.

D. Furnish any additional items, not specifically mentioned herein, to meet good engineering practice, without claim for additional payment. Such items may include, but are not limited to, hardware, transformers, terminal strips, connectors, resistors, capacitors, blank cover plates, and other Audio-Video devices for proper installation, interface, isolation, and/or gain structure. Furnish additional items not specifically mentioned herein as required to provide a fully functioning Audio-Video system.

E. Furnish shop drawings and receive design team and owner approval prior to procurement, fabrication, and installation.

F. Perform initial adjustments, verification tests, and final adjustments.

G. Assist the consultant in the Acceptance Testing of the systems. Refer to section 3.9 for detailed Acceptance Testing requirements and expectations.

H. Provide training of owner's staff on all AV system items listed in section 1.8-H.

I. Provide system documentation including copies of all relevant as-built documentation and equipment manuals.

J. Provide maintenance and warranty services for the specified period from the date of acceptance.

K. Note that the work scope under this section does not include the materials or installation for the AC power system except for the fabrication required within the equipment racks and where specifically called out in the contract documents.

L. Note that the scope of work described in this specification does not include materials or installation for the Audio-Video systems raceway. This includes conduit, couplings, hangers, supports, pull boxes, pull box lids, pull string, back boxes, lids/covers/blank plates for all AV boxes, and ladder tray.

1.8 SUBMITTALS

A. Bid submittals

1. Contractors shall examine, review, and acknowledge receipt of all drawings, specifications, and addenda prior to submitting a bid. No allowances will be made for failure to read and understand the bid documents. In the case where a conflict exists between the written specification and the drawings, the Audio-Video system contractor must seek written clarification from the consultant and design team prior to submitting a bid. Should the contractor fail to obtain written clarification, the interpretation of the consultant will prevail.

2. Request for clarification of the specification shall be made in writing not later than ten (10) days before the bid date.

3. Bid proposals shall include all work and equipment specified as well as any incidental items or Audio-Video equipment required in the fabrication, installation, and operation required to complete a functioning Audio-Video system.

4. The bid submittals shall include the following:

a. The total contract price.

b. A detailed breakout of the total contract price including:

1). Equipment

2). Cable

3). Miscellaneous materials

4). Labor

5). Insurance & bonding

c. Lump sum subsystem pricing based on the headings outlined in the equipment list.

d. The total price for each alternate.

e. An itemized list of all equipment and materials to be used in assembling the system, including:

1). Location of Item

2). Quantity

3). Manufacturer

4). Model

5). Description

6). Sale Price

f. A breakdown of labor costs estimated for:

1). General administration/project management.

2). Preparation of submittals, shop drawings, and as-built documentation.

3). On-site coordination meetings and supervision.

4). In-shop engineering, fabrication and assembly.

5). On-site wire pull.

6). On-site fabrication assembly and installation.

7). Audio-Video system programming

8). On-site verification and acceptance testing.

g. A detailed work plan for the anticipated installation of the AV systems, including key submittal and installation milestones, including but not limited to the following:

1). Contract Award

2). Identification of long-lead items

3). Shop Drawing submission

4). Shop Drawing approval

5). Equipment procurement

6). AV system rough in, fabrication, and termination

7). Acceptance testing

8). Training and Demonstration (refer to section 1.8-H)

9). Substantial Completion

B. Shop drawing submittals

1. It is the AV Contractor’s responsibility to review all of the contract documents and identify via RFI any discrepancies or items requiring clarification as it pertains to AV systems and related scopes of work.

2. Within sixty (30) days or a negotiated time period after the contract award, submit electronic copies of the shop drawings to the architect and consultant for review and comment. Do not begin procurement, fabrication, or installation without the approval of the architect and consultant.

a. Early procurement of long-lead items or other critical schedule impacts may be allowed with the explicit approval of the consultant. It is the AV contractor’s responsibility to provide adequate time for procurement of equipment for timely installation prior to the contractually agreed upon substantial completion date.

3. Review of the shop drawings and their acceptance do not constitute final approval of the system or its function. The contractor remains subject to the requirements of the contract documents.

a. The Consultant will review and provide comments on up to three submissions of the Preconstruction AV Shop Drawing package as described below. If this submittal is not accepted by the design team after three reviews, the contractor remains responsible for subsequent submittals and documentation as well as the other provisions listed in the Contractor Responsibility sections of this document.

4. It is the contractor's responsibility to assess potential lead times and establish a submittal and procurement schedule that allows for timely delivery and installation of the systems as documented in shop drawings and accepted by the design team.

   a. Failure of the contractor to submit shop drawings in sufficient time for design team review and comment will not entitle the contractor to a schedule extension or additional compensation.

5. Shop drawings must be computer-generated PDFs that are clear, legible, searchable by software PDF editors, of an appropriate scale, and include all information listed in the sections below.

6. Reproductions of the bid documents are not acceptable and will be rejected outright.

7. The pre-construction shop drawing submittal shall be submitted as one package and include the following items:

   a. Cover Sheet – Shop Drawing Submittal Checklist (provided by consultant upon request after contract award)

   b. Table of contents

   c. Itemized list of all equipment, cable, and materials used to assemble the system. This list should include the manufacturer, model number, description of item, and quantity. No cutsheets or data sheets are required except as part of a substitution submittal. Itemized list should be organized by building location and system type, mirroring the order of equipment listed in Appendix A Major Equipment List.

      1). Include product data and cross-reference details for any substituted cable. Refer to section 2.1-D for additional information.

   d. Floor plans, ceiling plans, elevations, and other drawings as required identifying all AV infrastructure and major AV equipment, including their dimensioned locations.

   e. Provide a clear AV infrastructure termination schedule/cable run summary and cable schedule based on the AV termination schedule provided by the Consultant.

      1). The AV contractor is responsible for coordinating with the Electrical Contractor to ensure the raceway provided will be compliant with the installation requirements for cabling and AV infrastructure, including box sizing and mounting condition, NEMA rating, conduit sizing, routing, signal separation, and distance requirements.

   f. Detailed one-line signal diagrams of all systems showing point-to-point wiring connections (detailing the wire type, wire identification numbers, and termination method) for all equipment.

      1). Each wire, connection, and piece of integrated equipment must be shown with no bussing of cables or grouping of typical components or systems.

   g. Detailed schematic diagrams for all modified or custom low voltage circuitry. Examples include:

      1). GPIO wiring

2). Custom paging relay system

3). Muting or Zoning system

h. Detailed elevation drawings of all custom fabricated plates and panels, including each individual instance of all panels as well as connector labels and numbering. Coordinate box sizing, mounting condition, and other details as required with the Electrical Contractor prior to fabrication.

1). Full scale drawings of patch bay layouts and labeling.

i. Detailed equipment rack drawings for clarity and coordination:

1). Plan views

2). Section views

3). Rack elevations

4). Cable management, specifically with respect to cable routing within rack room, within racks, and entry into AV racks. Refer to drawing details.

5). Grounding and electrical isolation of rack and power raceway.

6). Acoustic isolation

7). Required clearances

8). Mounting heights

9). Structural requirements

j. Detailed mounting drawings for all loudspeakers, emitters, antennas, microphones, screens, displays, projectors, cameras, video walls, AV equipment racks, etc. showing rigging details and interface to the adjacent structure and architecture.

1). Customized or specialized rigging assemblies for any AV equipment require a structural engineer stamp at no additional cost to the owner.

k. All video projection systems require field verification and confirmation of geometry, throw distance, lens selection, projection screen black drop, and other details related to the projection system.

l. Measure the RF environment (minimally covering the range between 70MHz and 6 GHz) on site prior to generating an RF frequency coordination plan for all wireless communication devices including, but not limited to, wireless microphones and assistive listening transmitters/receivers. Provide a spreadsheet with channel assignments with frequency and location details.

C. One additional submittal package is required no later than one month prior to acceptance testing. The items listed below shall be submitted as one package:

1. IT coordination plan, including but not limited to:

a. Description of interface and coordination between AV systems and facility networks (e.g. list of facility network resources required for AV system functionality, their intended applications, and the contractor’s plan for implementation)

b. Wireless networking coordination plan, including locations of AV-specific wireless access hardware and verification of compliance with facility IT requirements

c. List of IP Addresses, Subnets, and VLANs for AV system networks as well as any network-based power/PoE requirements for each device.

2. Digital Signal Processor configurations – processor, and amplifier system starting files. Refer to section 2.3 for further requirements.
3. Control system page layouts with button-by-button descriptions of intended functionality in PDF format. Refer to section 2.4 for further requirements.
4. Training agenda, schedule, and supporting materials (presentations, etc.).

D. Substitution submittals

1. Substitutions will be considered only after the contract award. Bidding contractors shall base their bid on the listed equipment.
2. All substitutions require the written approval of the consultant.
3. The proposed substitutions must be equivalent to the specified products in quality, performance, construction, function, warranty, and conformance to the design intent.
    a. For discontinued equipment, it is the Contractor's responsibility to propose an equivalent for approval. Follow manufacturer's recommendations when available.
4. It is the responsibility of the contractor to prove to the satisfaction of the consultant and owner that the proposed substitution is equal to the specified product. The following shall be the minimal information required for consideration of the substitution:
    a. List of advantages to the owner.
    b. Cost savings to the owner.
    c. Printed specification sheets.
    d. Statement of previous field performance, reliability, and experience.
    e. A/B evaluation of the specified device and the proposed substitution.
    f. The contractor shall list the unit price of each item proposed for substitution and each specified item that is deleted.

E. Samples

1. Submit samples of custom work, finishes or other materials as required by the architect or consultant to verify quality and appearance.
2. Submit samples of proposed substitute equipment to the consultant in order to prove equivalency to the specified items.
3. Shipping costs associated with the samples shall be the responsibility of the contractor.

F. Verification test report

1. Submit a report detailing the results of the verification testing. Refer to paragraph 3.8 Verification Tests for details regarding the requirements of the verification testing.
2. A template for Verification test reports may be provided by the consultant upon request.
3. This report must be completed and submitted to the consultant no fewer than five (5) days prior to acceptance testing.
4. Submission of the verification test report certifies that the installation conforms to the bid specifications, is complete, and is ready for the acceptance testing by the consultant.

5. The consultant will visit the site once to perform the acceptance testing. Should the system not be ready upon the consultant's arrival for acceptance testing and final optimization, the contractor will bear full responsibility for all expenses and professional fees associated with a return trip by the consultant. Current rates are minimum $185 per hour plus expenses. Consultant will provide Audio-Video Contractor with estimated cost for return trip if required.

G. As-built drawings

1. Within thirty (30) days of the completion of acceptance testing, prepare and submit electronic copies of the as-built documentation in PDF and CAD format. The As-built drawings shall be submitted as one package for review and approval.
2. The as-built documentation shall consist of the shop drawing submittal updated, corrected, and reflecting all field modifications and changes.
3. One-line signal flows shall be updated with all cable runs and patch points identified by alphanumeric character.
4. A laminated copy (minimum 11x17 page size) of the one-line signal flows shall be provided in the back of each bay of permanent racks.
5. A laminated copy (minimum 11x17 page size) of a Clean Technical Power circuit schedule listing all circuits and associated panel board shall be provided as part of the as-built package.

H. Owner's manuals

1. Within thirty (30) days of the completion of the acceptance testing, prepare and submit three (3) copies of the operation and maintenance manuals to the owner. These copies are in addition to the one copy provided to the consultant during the acceptance testing. Manuals are to be submitted in electronic form with 2 sets supplied on USB media, and one set supplied as a paper copy bound in a binder OR an electronic tablet. Tablet is to include a ruggedized protective case and all applications necessary to view the provided content.
2. The manual is to include:
    a. Table of contents.
    b. Warranty statement.
    c. Emergency contact information.
    d. Rigging information (documentation on any dynamic rigging systems operation and maintenance).
    e. Basic power on/off procedures.
    f. All available manufacturer's operational and service manuals for each piece of equipment identified in the equipment list.
    g. A copy of the verification test report.
    h. A copy of the final digital signal processor settings as provided by the consultant.
    i. Network information (a copy of Audio-Video network settings listing all static IPs, and login information per device, along with router and WAP default setup files.)
    j. A copy of any default system starting files for mixers, Digital Signal Processors, amplifiers, and other programmable or configurable audio equipment.

k. A copy of any default system starting files for video matrix routers, switchers, robotic cameras, servers, playback or recording equipment, and other programmable or configurable video equipment.

l. A copy of all calibrated setup files for projectors, displays, and cameras.

m. Control systems (a copy of any control system files per job closeout).

n. Training Material (a copy of all presentation and training documentation).

I. Training

1. The contractor shall provide the following Audio-Video system training.

2. Training must be presented by competent personnel, who are familiar with the detailed operation of the systems in discussion. Training provided by the manufacturer is an acceptable alternative.

a. Provide a minimum of 1 hour training on all equipment and system operation, including the topics noted below.

b. Training should be scheduled by the AV contractor to occur after successful completion of Acceptance Testing

1). Coordinate with the owner, Consultant, and Construction Team to schedule training and confirm attendees.

c. The owner will select personnel to attend training sessions.

1). The Contractor shall submit an agenda or outline to the owner and consultant prior to each training session for review and comment.

d. Training should cover the following topics at a minimum:

1). System setup

2). System operation

3). Best practices

3. First use and additional event support

a. Provide at least 1 technician to support the facility's technical staff during the first system use (as determined by owner).

b. Technicians present during events must be capable of operating all Audio-Video equipment provided and make necessary changes to system programming or configuration.

1.9 JOB CONDITIONS

A. The contractor shall:

1. Review the conduit system design with the Electrical Contractor prior to installation and notify the consultant, the architect and the Electrical Contractor of any deficiencies or inadequacies.

2. Always keep the job adequately staffed. The contractor shall keep the same individual in charge of the project from start until finish, except in the case of circumstances beyond the contractor's control.

3. Cooperate with all parties to achieve coordinated progress throughout the construction schedule and successful integration of the Audio-Video systems.

4. Watch for conflicts with other trades on the project and execute, without claim for additional compensation, moderate moves or changes as are necessary to accommodate other equipment or to preserve acoustic performance, symmetry, function, and aesthetics.
5. Immediately report to the architect and consultant any design or installation irregularities that may obstruct or interfere with the intended coverage patterns of loudspeakers, infrared emitters, projectors, cameras, or other AV equipment or infrastructure.
6. Do all cutting, patching, and painting for proper and finished installation of the Audio-Video systems in coordination with the other trades.
7. Repair any damage to work completed by others caused by the installation of the Audio-Video systems.
8. Leave the job site and all equipment and materials clean and free from marks and blemishes.

B. Quality assurance

1. All supplied equipment must meet the manufacturer's specifications.
2. All equipment, parts and materials supplied shall be new and free from manufacturing defects.
3. All equipment, parts and materials must conform to applicable provisions of Underwriters Laboratories and the American Standards Association.
4. The contractor shall obtain and incur all costs for all required permits, licenses and inspections and conform to any requirements stipulated therein.
5. The contractor shall comply with federal, state, and local labor regulations including any applicable union agreement.
6. The Audio-Video systems installation shall conform to latest federal, state, and local electrical and safety codes. Where conflicts exist, the most stringent code or regulation shall apply.

1.10 GUARANTEE AND SERVICE

A. The contractor shall for a period of one year, after final acceptance of the system, repair or replace all defective equipment or workmanship at no cost to the owner. This service and support shall be provided irrespective of any limitations of the manufacturer's warranty or equipment procurement timelines.

B. All equipment supplied under this specification shall be warrantied for parts and labor for the full period of the manufacturer's standard warranty, or for the duration of the contractor's warranty period, whichever is longer.

1. All manufacturer's warranties that exceed the length of the contractor's warranty period must be valid and transferable to the owner for the full duration of the manufacturer's warranty period.

C. The contractor shall repair or replace the defective item within forty-eight (48) hours following notification by the owner.

D. The contractor shall be available on call and on eight (8) hour notice during the first month following the acceptance of the system, to assist the owner with any problems that may arise during the initial period of operation.

E. Should any device demonstrate repeated failure (i.e. more than two service visits are required to address defects) during the warranty period the contractor shall supply and install a new component or software configuration at no additional cost to the owner.

F. Unless specifically identified in this section, owner-directed changes to the system configuration during the warranty period are not covered by the AV contractor's warranty.

G. The contractor shall provide a minimum of two (2) service visits to the site for inspection and adjustment of equipment during the warranty period. During the last month of the warranty period the contractor shall contact the owner to inquire as to the condition of the system and schedule a final (second) warranty visit. During the visit, the contractor shall evaluate the systems' working condition and repair any problems or defects that may exist.

1.11 INSURANCE

A. The contractor shall fully insure all materials and equipment against loss or damage until acceptance of the system by owner.

B. The contractor shall refer to the general conditions section of the specification for other project insurance requirements including but not limited to liability, workers compensation, coverage limits, and bonding requirements.

1.12 EXISTING CONDITIONS

A. The contractor shall visit the site and review the architectural drawings prior to submitting a bid. No allowance or claim for additional services or fees will be allowed for failing to observe or verify conditions that may affect the installation of the Audio-Video systems.

B. The contractor shall report in writing to the architect and consultant any discrepancies between the specification and existing conditions prior to submitting a bid.

PART 2 - EQUIPMENT

2.1 GENERAL EQUIPMENT

A. Where the specification calls out a manufacturer and model number it is for the purpose of establishing a standard of quality, performance, and function.

B. All equipment shall operate at the required line voltage.

C. The contractor shall provide quantities as indicated in the equipment list, detail drawings, location drawings, termination schedule, and otherwise as required for a complete, professionally installed system.

D. Audio and video wire and cable:

1. All cable must meet or exceed all local, state, or federal ordinances, codes, or regulations. Where a conflict exists between these regulations the most stringent shall apply.

2. All wire numbers listed in the specification and drawing set are listed for the purpose of establishing a standard of quality, performance, and function.

3. Should the contractor desire to use cable other than the manufacturer and model specified in the drawing set:

   a. The AV contractor shall submit to the consultant a manufacturer-supplied cross-reference list specifying the substituted cable part number as equivalent to the specified model number that it replaces.

   b. Verify and revise the conduit system sizing as needed to accommodate the potential differences in cable size between manufacturers.

   c. Incur any additional costs associated with increasing the conduit sizes due to the substitution.

4. Pre-approved cable manufacturers are:

   a. West Penn Wire

b. Belden CDT Inc.

c. Gepco

d. Windy City Wire

e. Approved equal

E. Cable Assemblies

1. All cable assemblies must be suitable for repeated bending and movement without damage to conductors or connector. Installation-grade cable is not permitted to be used for cable assemblies.

2. SDI cable assemblies must pass 12G-SDI signals at 24 GHz for SDI, HD-SDI, UHD-SDI, 4K, 8K, and HDR applications. Cable assemblies must comply with SMPTE 259M, 292M, 424M, 2081-1, and 2082-1 compliant standards. Approved cable assembly manufacturers are:

   a. Canare

   b. BTX

   c. Comprehensive

   d. Gepco

3. HDMI cable assemblies must comply with HDMI 2.0 standard at a minimum, and pass UHD/4K signals at 60hz refresh rate, with 4:4:4 color sampling and be certified for 18 Gbps high-speed end-to-end transmission.

   a. Approved cable assembly manufacturers are:

      1). BTX

      2). Comprehensive

      3). Extron

   b. All HDMI runs should be continuous with no barrels or splicing. Barrels are allowed at plate connection points only.

4. USB-C cable assemblies must comply with USB4 standard, and include full support for signal transport, full-bandwidth video, and power delivery.

   a. Approved cable assembly manufacturers are:

      1). BTX

      2). Comprehensive

      3). Newnex

5. Peripheral cable assemblies for connection within equipment racks or loose cable for DisplayPort, DVI, VGA, USB, Thunderbolt, and Serial control must be provided by one of the following pre-approved cable assembly manufacturers:

   a. Comprehensive

   b. BTX

   c. Extron

6. Typical category cable assemblies must meet or exceed the standard specified for use in all jacks, patch panels, and other associated devices in the signal path. Approved cable assembly manufacturers are:

   a. Belden

b. Hubbell

c. HellermannTyton

d. Comprehensive

7. Tactical-grade category cable assemblies must meet or exceed the standard specified for use in all jacks, patch panels, and other associated devices in the signal path. Approved cable assembly manufacturers are:

   a. BTX

   b. Whirlwind

   c. Lex Products

   d. Entertainment Metals

   e. Link USA

8. LC Fiber cable assemblies for single mode or multimode fiber must comply with or exceed OS/OM rating for patch panels, connectors, and all other devices in the signal path. Approved cable assembly manufacturers are:

   a. Comprehensive

   b. Bittree

   c. Belden

   d. Hubbell

   e. HellermannTyton

9. Neutrik OpticalCON tactical-grade cable assemblies must comply with or exceed OS/OM rating for patch panels, connectors, and all other devices in the signal path. Approved cable assembly manufacturers are:

   a. Camplex

   b. BTX

   c. Gepco

   d. Joseph Electronics

10. SMPTE hybrid tactical-grade cable assemblies must comply with SMPTE 304M jack and 311M cable requirements. Approved cable assembly manufacturers are:

    a. Camplex

    b. Canare

    c. Gepco

    d. Joseph Electronics

    e. BTX

11. Specialty fiber tactical-grade cable assemblies must match specified specialty connection jack. Approved cable assembly manufacturers are:

    a. Joseph Electronics

    b. Gepco

    c. BTX

    d. Link USA

12. TT (Bantam) and ¼" (Longframe) cable assemblies for patchbays must be certified to pass AES/EBU signals with word clock coherence to 192 kHz. Approved cable assembly manufacturers are:
    a. Bittree
    b. Mogami
    c. Neutrik
    d. ADC
13. WECO and Mini-WECO cable assemblies for patchbays must meet full bandwidth capabilities of specified patchbay connection jack. Approved cable assembly manufacturers are:
    a. Bittree
    b. Canare
    c. ADC
    d. Switchcraft
14. XLR cable assemblies for patching must be certified to pass AES/EBU signals with word clock coherence to 192 kHz. Approved cable assembly manufacturers are:
    a. Canare
    b. Gepco
    c. Whirlwind
    d. Link USA
    e. Lex Products
    f. Entertainment Manufacturing Group (EMG)
15. Portable XLR microphone cable assemblies must have a highly flexible, non-reflective matte black (unless noted otherwise) PVC jacket, stranded center conductors, braided shield, and Neutrik X-series black shell connectors. Approved cable assembly manufacturers are:
    a. Lex Products
    b. Entertainment Manufacturing Group (EMG)
    c. Link USA
    d. Whirlwind
16. NL4 and NL8 cable assemblies must have a highly flexible, non-reflective, matte black (unless noted otherwise) PVC jacket, stranded conductors. Speakon cable assemblies utilizing NL2 connectors or NL4 connectors with only single pair terminated will not be allowed. Approved cable assembly manufacturers are:
    a. Lex Products
    b. Entertainment Manufacturing Group (EMG)
    c. Link USA
    d. Whirlwind
17. Portable instrument (unbalanced ¼") cable assemblies must havee highly flexible, non-reflective matte black (unless noted otherwise) PVC jacket, stranded center conductors, and braided shield. Approved cable assembly manufacturers are:

a. Lex Products

b. Entertainment Manufacturing Group (EMG)

c. Link USA

d. Whirlwind

18. Portable power cable assemblies must be rated to support the current capacity of its matching receptacle, and have a highly flexible, non-reflective, matte black (unless noted otherwise) PVC, weather-rated jacket. Approved cable assembly manufacturers are:

    a. Lex Products

    b. Entertainment Manufacturing Group (EMG)

    c. Link USA

19. Specialty cable assemblies must meet the requirements outlined in the Major Equipment List and AV drawing set. Approved cable assembly manaufacturers are:

    a. Link USA

    b. Entertainment Manufacturing Group (EMG)

    c. Lex Products

20. Radio frequency antenna cabling assemblies for wireless microphone systems, wireless in-ear systems, and wireless intercom systems. Must utilize low loss, 50 ohm RG8X coax cable with double shield braid over foil, and have semi to high cable flexibility. Cables are to be terminated with an appropriate connector to connect directly to equipment without the use of any inline adaptors. Approved cable assembly manufacturers are:

    a. RF Venue

    b. Professional Wireless Systems

    c. Manufacturer of Wireless Equipment Specified in Appendix A

    d. Approved Equal

21. Radio frequency video distribution/CATV cabling assemblies must utilize type RG 6/U Non-Plenum, 75 ohm, 18 AWG Copper Covered Steel Center Conductor with a Quad Shield 100% Foil, 40% Aluminum Braid, 100% Foil, 60% Aluminum Braid. Cables are to be terminated with an appropriate connector to connect directly to equipment without the use of any inline adaptors. Approved cable assembly manufacturers are:

    a. Windy City Wire

    b. BTX

    c. Comprehensive

    d. Approved Equal

F. Electrical wire and cable

1. All cable must meet or exceed all local, state, or federal ordinances, codes, or regulations. Where a conflict exists between these regulations the most stringent shall apply.

2. Cable shall be THHN or as required by code.

G. Wiring devices

1. All wiring devices must meet or exceed all local, state, or federal ordinances, codes, or regulations. Where a conflict exists between these regulations the most stringent shall apply.

H. Electrical plates and panels

1. Rack panels shall be minimum 1/8” thick anodized aluminum or powder-coated 16-gauge steel, black in color with white labels unless noted otherwise. All rack panels must be flanged to increase rigidity.
    a. Labeling shall be engraved, etched, or inherently permanent. Adhesive labeling or screen-printed text is not allowed.
    b. Panels with different materials or finish requirements are defined on Audio-Video rack panel elevation detail drawings.
2. Termination plates shall be minimum 1/8” thick anodized aluminum, black in color with white labels unless noted otherwise
    a. Labeling shall be engraved, etched, or inherently permanent. Adhesive labeling or screen-printed text is not allowed.
    b. Plates with different materials or finish requirements are defined on Audio-Video termination schedule or Audio-Video panel detail drawings.
    c. All plate finishes must be approved by the architect prior to procurement and installation.
3. All plates and panels with fiber connections must have separate back box mounted to plate or panel, or another approved protection scheme, to avoid damage to fiber connection points.
4. Approved manufacturers:
    a. Entertainment Manufacturing Group (EMG)
    b. Link USA
    c. Approved equal

I. Audio transformers

1. Audio transformers not specifically called out by part number shall be selected to meet the specific requirements of the design application.
    a. Approved manufacturers:
        1). Jensen Transformers
        2). Lundahl Transformers

J. Audio connectors

1. All cable-mount and panel-mount connectors shall be manufactured by Neutrik unless otherwise noted.

K. Video connectors

1. All cable-mount BNC connectors shall be 3-piece crimp. No compression crimp allowed.
    a. Approved manufacturers:
        1). CommScope
        2). Kings
        3). Canare

4). Amphenol

2. All cable-mount F-connectors shall be compression crimp. No overall body crimp allowed.

a. Approved manufacturers:

1). ICM

2). Belden

3). Digicon

1. All cable- and panel-mount Triax connectors shall be multi piece crimp.

b. Approved manufacturers:

1). CommScope

2). Kings

3). Amphenol

L. Network connectors

1. All panel-mount connectors shall be punch down (no barrel connectors allowed unless otherwise noted).

a. Approved manufacturers:

1). Panduit

2). Neutrik

3). Legrand

4). Hubbell

5). Signamax

6). Belden

2. All cable-mount connectors shall be cable guided inserts with crimp (no pass-through cut & crimp allowed).

a. Approved manufacturers:

1). Panduit

2). Neutrik

3). Legrand

4). Hubbell

5). Signamax

6). Belden

M. Fiber connectors

1. All cable mount connectors shall be terminated per manufacturer specifications.

a. Approved manufacturers:

1). Panduit

2). Belden

3). Neutrik

4). Lemo

2. All panel mount connectors shall be terminated per manufacturer specifications.
    a. Approved manufacturers
        1). Panduit
        2). Neutrik
        3). Belden
        4). Lemo

N. Terminal blocks
1. All microphone, line level, and intercom splicing shall utilize insulation displacement type terminal blocks and DIN-rail mounting methods.
    a. Approved manufacturers:
        1). Phoenix contact
        2). Entrelec
        3). Omega

O. All speaker level splicing shall utilize spring-loaded conductor connection type terminal blocks and DIN-rail mounting methods.
1. Approved manufacturers:
    a. Phoenix contact
    b. Entrelec
    c. Omega

2.2 MAJOR EQUIPMENT

A. Major equipment consists of all components and products required to communicate the design intent and establish a standard of quality, performance, or function.

B. Minor equipment consists of items that are not identified in the Major Equipment List but are required to complete the installation and provide a professional, working system.

C. The contractor shall provide the equipment specified in appendix A, or approved substitute (see paragraph 1.8.C). Additionally, the contractor shall provide all incidental products and materials required for a complete installation even if not explicitly described in the Contract Documents.

2.3 DIGITAL SIGNAL PROCESSING (DSP) REQUIREMENTS

A. Required Deliverables
1. DSP and DSP-based Amplifier Layouts and Control Pages shall be submitted to the design team for review and comment no later than one month prior to Acceptance Testing.

B. Program Requirements
1. The Digital Signal Processing system is responsible for routing and mixing the audio signals from the inputs to the loudspeakers, providing volume controls and video transport controls.

2.4 CONTROL SYSTEM REQUIREMENTS

A. A kickoff meeting for Control System design and functionality, with the AV consultant’s and owner’s participation, shall be scheduled prior to developing the deliverables listed in 2.4-B.

B. Required Deliverables

1. A page-by-page, button-by-button list and control panel layouts shall be provided at least one month prior Acceptance Testing. This should include the function of each button, page flips, popup pages etc.
2. Up to two owner-directed revisions of the control panel layout shall be provided prior to program implementation.
3. Up to one owner-directed revision of the control system programming and control panel layout shall be provided within the warranty period at no additional cost to the owner.

C. Touch Panel Layout

1. Touch panel layouts shall be coordinated with the owner or owner's representative and AV consultant.

PART 3 - EXECUTION

3.1 GENERAL

A. The contractor shall install all systems specified herein utilizing the highest standards of craftsmanship and in accordance with good engineering practice.

B. The contractor shall install all equipment in accordance with this specification and the manufacturer's recommendations.

C. All equipment and devices shall be installed neatly, plumb, square and with respect to the aesthetic of the project.

D. The standard reference for installation and implementation of the audio and video systems design specified herein shall be: AVIXA ANSI Standards, Audiovisual best practices Infocomm International, PLASA technical standards, and Audio Systems Design and Installation by Philip Giddings, Focal Press, Boston, MA.

3.2 CONDUIT

A. The contractor shall review the termination schedule, Audio-Video System Raceway (ASR) guidelines, and other supporting information issued as part of the contract documents and field coordinate with the electrical contractor to ensure proper sizing, routing, separation, and operation of the Audio-Video systems.

B. All the Audio-Video system cabling must be housed in a continuously grounded, ferrous metallic ASR, including all conduit installed or encased in concrete. PVC or aluminum conduit is only acceptable below ground.

C. The contractor shall coordinate with the general contractor (or construction manager) and visit the construction site frequently to inspect the installation of the ASR during construction. Visits shall be scheduled prior to pouring of concrete or other construction that would cover or encapsulate the ASR. The consultant and architect shall be notified immediately regarding construction methods inconsistent with the requirements identified in the contract documents.

3.3 RIGGING

A. The Audio-Video systems contractor shall be responsible for the installation and mounting of all equipment specified herein.

B. The Audio-Video systems contractor shall coordinate with all applicable trades for proper installation and performance of the specified equipment.

C. The Audio-Video systems contractor shall provide detailed mounting drawings for all devices that will attach to surfaces or structures, including but not limited to loudspeakers, video monitors, LED walls, projectors, cameras, emitters/antennas, and wall-mounted equipment racks.

D. The minimum safety factor for all mounting and rigging shall be the USA industry established 5:1 OR the local code, whichever is higher. Always defer to project structural engineer, as higher standards may apply in certain scenarios.

1. The Audio-Video systems contractor shall be responsible for the safe and proper installation of all devices specified herein and shall adhere to all applicable federal, state, and local codes, regulations, and standards.

2. A reference for the rigging and suspension of loudspeakers, projectors, video walls, screens, truss, and linesets. Shall be *Entertainment Rigging for the 21st Century*, by Bill Sapsis. *Entertainment Rigging*, by Harry Donovan. *Stage Rigging Handbook*, by Jay O. Glerum.

E. The installation of mounting brackets or supports shall not weaken or overload the building structure. Coordinate as necessary with the project's structural engineer and if necessary, secure the services of a structural engineer licensed in the state of the project for any unique or questionable structural matters.

F. Audio-Video equipment mounting hardware and systems shall not share or utilize fixtures, devices, or supports intended for other trades or systems unless specifically noted.

G. The Audio-Video systems contractor shall coordinate with General Contractor any backing or reinforcement needed to meet required safety factor and other applicable local, state, or federal codes.

H. Projectors should be positioned to provide a properly aligned image without using keystone correction or horizontal lens shift, unless directed by consultant.

I. The Audio-Video systems contractor shall not cut, drill, weld or otherwise alter any structural member without the written authorization of the architect and project structural engineer.

3.4 WIRING

A. All Audio-Video wiring or cabling shall be installed with respect to proper routing, types, quantities, lengths, identification, and separation.

B. Splicing of cables is not permitted between points of termination unless directed by the consultant.

C. All wires and cables shall be permanently and uniquely labeled and accurately documented on the as-built drawings. "P-Touch" or similar printed labels are not permitted.

1. Labels are required for spare cables that are not terminated to equipment or plates/panels.

2. Approved cable ID labels:

a. Brady Jet-30 type

b. Phoenix Contact adhesive wrap labels

D. Pull all wire and cable in accordance with the manufacturer's requirements regarding lubricant, pulling tensions, bend radius and temperature. Protect the cable and wiring from abrasion, kinks, and excessive tension during installation.

E. All exposed cable ends, e.g. where it meets a terminal block, shall be wrapped with shrink tubing and each shield or drain wire sheathed in clear tubing.

F. All cabling and wiring shall be grouped, neatly bundled, and labeled according to signal level in all enclosures and racks utilizing hook & loop (e.g. Velcro®) tie wraps of the appropriate size. Zip ties are not allowed.

G. Service loops should be provided at all panel and equipment terminations allowing ease of dismounting for installation, service, and inspection.

H. All devices shall be installed and wired with respect to proper polarity. Absolute polarity shall be maintained throughout the entire audio chain.

1. Polarity for XLR type connectors shall be: pin 2 hot, pin 3 cold, and pin 1 shield.

2. Polarity for ¼"-TRS type connectors shall be tip hot, ring cold, and sleeve shield.

3. Connector polarity shall be maintained throughout the system except for terminations at equipment manufactured to other standards. Should this case exist the connector shall be flagged with a label noting the variance.

3.5 EQUIPMENT RACKS

A. All equipment racks shall be considered custom assemblies and shall be fabricated and tested at the contractor's facility prior to installation at the site.

B. Equipment racks shall not be brought to the site until the rooms they are to be set in are painted, cleaned, dust free and ready for occupancy.

C. All equipment racks shall be installed level and square allowing both front and rear access per code. Submit drawings detailing the placement of the racks coordinated with all other furniture, fixtures, and equipment prior to installation.

D. All equipment racks shall be electrically isolated from the floor.

E. All equipment racks shall be electrically isolated from the conduit system as detailed in the electrical plans and specifications.

F. All equipment shown in the rack elevation drawings is placed for proper operator convenience. Submit any changes for consultant approval with the shop drawing submittal.

G. All wiring and cable shall be formed into harnesses, neatly grouped, Velcro® wrapped and supported by vertical and horizontal lacing bars. All cables connecting to equipment, patch bays, and panels must be supported by horizontal lacing bars.

1. Wiring accessories for cable management in racks shall be provided by the AV contractor as required.

H. All wire, cable, terminals, and equipment shall be clearly labeled as to their function, circuit, or system.

I. All equipment shall be placed in the rack with regards to logical signal flow, EMI, proper ventilation, and operator convenience. Submit any changes to the bid specification rack elevations for approval as part of the shop drawing submittal.

J. All empty spaces on the front of the rack shall be filled with blank panels.

3.6 VERIFICATION TESTS

A. Verification tests are to be completed by the Audio-Video systems contractor prior to the consultant's site review and acceptance testing. See submittal requirements in section 1.8.F.

B. The Audio-Video systems contractor shall provide the initial adjustment and testing of the Audio-Video systems to ensure that the systems are properly installed, operational, and ready for acceptance testing.

1. All systems shall be tested to confirm:

a. All audio and video outputs are free from spurious signals including oscillations, clicks, humming, buzzing, radio frequency signals, visible or audible distortion or interference, or other detectable degradations of the signal.

b. Absolute polarity is maintained throughout the entire system.

C. The Audio-Video systems contractor shall remediate all documented failures of verification tests.

D. The Audio-Video systems contractor shall perform the following tests, adjustments, and verifications and include the results as part of the verification test report prior to acceptance testing.

1. For all of the tests listed below, results generated by a certified or specialized testing device are acceptable.
2. Each Audio-Video clean technical power outlet shall be tested to verify proper polarity, grounding, and voltage.
3. All wires and cables shall be checked to ensure that each is uniquely marked, labeled at both ends, clearly visible, and documented on the as-built drawings.
4. Each microphone, audio, intercom, video, control, AV data, RF, and speaker line shall be tested and documented confirming:
    a. Each circuit appears at its proper point of termination.
    b. The continuity of each conductor.
    c. The absolute polarity of each circuit.
    d. The absence of shorts between conductors or between a conductor and an external ground reference (e.g., the conduit system).
5. Each category cable shall be tested and documented confirming compliance with the minimum performance parameters set forth by ANSI/BICSI N1-2019.
    a. Results generated by a certified cable tester are acceptable.
6. Each HDMI cable shall be tested and documented confirming compliance with the HDMI 2.0 standard for resolution, bandwidth, and color.
7. Each SDI cable shall be tested and documented confirming compliance with the maximum performance standard specified by the cable manufacturer.
8. Each optical fiber strand shall be tested and documented confirming minimum performance parameters set forth by ANSI/TIA-568.3-D standards.
    a. Results generated by a certified cable tester are acceptable.
9. All contractor-supplied equipment, parts, and materials shall be confirmed to be new and free from defects.
10. All devices shall be configured according to the manufacturer’s recommendations.
11. Perform reasonable sound system testing at a safe maximum level to identify any items that rattle or vibrate audibly while the system is in use.
    a. If a loudspeaker excites other objects in the space to audible vibration, alert the General Contractor, acoustician, and AV consultant.
12. All control systems shall be tested to confirm the functionality as described in approved submittals.
13. For projection systems, provide report of measured brightness and contrast using a calibrated light meter under lighting conditions representative of typical use cases.
14. For each radio frequency cable, provide a frequency-based measurement of dB signal loss across the operating range of its intended use.
    a. Results generated by a certified cable tester are preferred.
15. All RF-modulated video distribution systems shall be balanced according to standards in Blonder Tongue Broadband Reference Guide.

16. For all wireless (RF) transmission systems verify the following based on the Wireless Coordination Plan submitted as part of the shop drawing package:
    a. Wireless spectrum scanned in situ and open frequencies identified.
    b. Appropriate wireless groups and frequencies set on all transmitters and receivers.
    c. Gain structure set on all transmitting and receiving devices.
17. All equipment shall have the latest stable version of firmware installed.

3.7 ACCEPTANCE TESTING

A. Prior to the scheduled acceptance testing visit, the following conditions should be met:
    1. Receipt and acceptance of the verification test report by the Consultant
    2. All specified systems functional and configured according to factory recommended settings
    3. All labels for equipment, patch bays, installed cabling, and software configurations complete
    4. All equipment installed, aimed/aligned/focused, and with manufacturer's recommended processing applied
    5. Control systems and audio signal processors free of errors and malfunctions
    6. All specified loose/portable equipment available onsite. The AV Contractor is responsible for confirming that all specified equipment is turned over to the Owner.

B. The consultant will perform the acceptance testing during a period scheduled by the architect/general contractor/owner. The minimum expected time is one (1) working days of dedicated quiet.

C. The contractor shall coordinate this time with the architect, general contractor, owner, and all other applicable parties to ensure:
    1. A quiet testing environment.
    2. Complete access to all areas, equipment, devices, and loudspeakers (including lifts/ladders where required).
    3. Adequate work lighting.
    4. Availability of electrical power.
    5. Portable work surface.
    6. If available, coordinate guest access to wireless internet for use during acceptance testing

D. The contractor shall furnish a minimum of one (1) technician for the duration of the acceptance testing.

E. At the time of acceptance testing the contractor shall have available all approved shop drawings noting any field changes, modifications, and corrections and a copy of the operation maintenance manual for use during the testing and final tuning of the systems.

F. The contractor shall provide the following test equipment for the duration of the acceptance testing.
    1. General tools
        a. High impedance multi-meter

b. Laptop preloaded and connected with all software needed to communicate with equipment onsite.

2. Audio tools
   a. Pink noise/tone generator for both analog and digital signals
   b. Measurement microphones (minimum of 1 on site, with stands/clips and cables)
   c. Smaart or Systune
   d. Loudspeaker impedance measurement system
   e. Portable audio monitor with analog & AES inputs.
   f. Level 3 digital cable analyzer
   g. RF spectrum analyzer
3. Video tools
   a. Multi-format video signal generator (HDMI, SDI, VGA, et al.)
   b. SDI based multi-format, multi-standard portable waveform monitor
   c. HDMI/VGA EDID reader
   d. Portable ENG monitor with SDI, component, composite, HDMI, DVI, and VGA capabilities.
   e. HDMI/SDI audio embedder and de-embedder for both analog and digital audio signals
4. Network tools
   a. Fluke One Touch Network Assistant (or equivalent) with all adapters for fiber connections and category cable connections.

G. The contractor shall be prepared to verify all tests performed as part of the verification test report and assist in the balancing, adjustment, and tuning of all systems.

H. The contractor shall be prepared to make additional modifications to the systems within the scope of the bid specification and as deemed necessary by the consultant to meet the design and performance intent of the systems. These may include realignment of loudspeakers, projectors, displays, cameras, changes to interconnections including grounding, isolation, and filtering, and/or changes to gain structure.

I. During the acceptance testing, a punch list will be developed and shall serve as the consultant’s written acceptance of the contractor’s substantial completion.

J. Final acceptance shall be contingent on the satisfactory completion of the items documented in the punch list and delivery and acceptance of the as-built documentation and owner’s manuals.

END OF SECTION

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MAJOR EQUIPMENT LIST

Location

System

ID#	QTY	Manufacturer/Model	Description
Reading Room			
AV DSP & Processing			
TA 1	1	QSC CORE 8 FLEX	Unified Core With 8 Local Audio I/o Channels, 64x64 Network I/o Channels With 8x8 Software-based Dante License Included, Usb Av Bridging, Dual Lan Ports, Voip Telephony, 8x8 Gpio, 8 Aec Processors, Half-size 1ru.
TA 2	1	Visionary Solutions D5100	The D5100 is an AV over IP endpoint designed for 4K video in converged AV/IT environments. It supports 4K60 4:4:4 video and has ultra-low latency of about one frame. The D5100 also features a dynamically optimized bit-rate compression codec that uses AI to analyze input source content. This codec ma
AV Equipment Racks			
TA 3	1	Custom Allowance	Nucraft High Tech Case Lectern AVFL-3245-CP with Gooseneck Microphone, Fixed Upper shelf, Fixed lower shelf, Light with Dimmer, 1x FLDF-15 panel. Finish TBD by Architect.
AV Network & Computers			
TA 4	1	Netgear GSM4212PX	12 Port POE+ Switch 240W
AV Power			
TA 5	1	Middle Atlantic PD-915R	Rackmount Power, 9 Outlet, 15A, Basic Surge
Control			
TA 6	1	QSC TSC-70-G3	High Definition Touch Screen Controller
TA 7	1	QSC TSC-710T-G3	Table Top Mounting Accessory For TSC-70-G3 And TSC-101-G3
Hearing Assistance			
TA 8	1	Listen Technologies LS-53-072	RF system include LT-800-072-01 transmitter, LA-106 antenna, LR-4200-072 receiver, LA-401 ear speaker and other, 72 MHz
Loudspeaker 70V Distribution			
TA 9	3	QSC AD-C6T-ZB-WH	6.5" Two-way In-Ceiling Zero-Bezel Speaker - White
Speakers and Amplifiers			
TA 10	1	QSC SPA-QF60X2-NA	2-Channel Flex Amplifier LO-Z/HI-Z

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MAJOR EQUIPMENT LIST

Location

System

ID#	QTY	Manufacturer/Model	Description
Video Transport			
TA 11	1	Visionary Solutions DuetE-5	4K60 4:4:4 Video Analog & Dante/AES67 Audio over Gigabit Ethernet
Wired and Wireless Microphones			
TA 12	1	Shure BLX1288/MX153-H10	BLX1288 COMBO W/MX153 AND SM58

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fire alarm system design and installation, including all components, wiring, and conduit.

B. Transmitters for communication with supervising station.

C. Circuits from protected premises to supervising station, including conduit.

D. Replacement and removal of existing fire alarm system components, wiring, and conduit indicated.

E. Maintenance of fire alarm system under contract for specified warranty period.

1.02 RELATED REQUIREMENTS

A. Designed using manufacturer's product-specific design software or based on manufacturer's pre-engineered design suitable for the application.

B. Section 211300 - Fire-Suppression Sprinkler Systems: Supervisory, alarm, and actuating devices installed in sprinkler system.

C. Section 233300 - Air Duct Accessories: Smoke dampers monitored and controlled by fire alarm system.

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 - 2010 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.

F. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 268 - Standard for Smoke Detectors for Fire Alarm Systems; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements, for submittal procedures.

B. Proposal Documents: Submit the following with cost/time proposal:
   1. NFPA 72 "Record of Completion", filled out to the extent known at the time.
   2. Manufacturer's detailed data sheet for each control unit, initiating device, and notification appliance.
   3. Certification by Contractor that the system design will comply with Contract Documents.
   4. Proposed maintenance contract.

C. Evidence of designer qualifications.

D. 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.

E. Evidence of installer qualifications.

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 017800 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 017800 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.
4. Maintenance contract.
5. Report on training results.

J. Maintenance Materials, Tools, and Software: Furnish the following for Owner's use in maintenance of project.
   1. Furnish spare parts of same manufacturer and model as those installed; deliver in original packaging, labeled in same manner as in operating and maintenance data and place in spare parts cabinet.
   2. In addition to the items in quantities indicated in PART 2, furnish the following:
      a. All tools, software, and documentation necessary to modify the fire alarm system using Owner's personnel; minimum modification capability to include addition and deletion of devices, circuits, and zones, and changes to system description, operation, and evacuation and instructional messages.
      b. One copy, on CD-ROM, of all software not resident in read-only-memory.
      c. Extra Fuses: Two for each installed fuse; store inside applicable control cabinet.

1.05 QUALITY ASSURANCE

A. Copies of Design Criteria Documents: Maintain at the project site for the duration of the project, bound together, an original copy of NFPA 72, the relevant portions of applicable codes, and instructions and guidelines of authorities having jurisdiction; deliver to Owner upon completion.

B. 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.

C. 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.

D. Maintenance Contractor Qualifications: Same entity as installer or different entity with specified qualifications.

E. Instructor Qualifications: Experienced in technical instruction, understanding fire alarm theory, and able to provide the required training; trained by fire alarm control unit manufacturer.

F. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

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. Fire Alarm Control Units and Accessories:
   1. Match existing system.
   2. Provide control units made by the same manufacturer.

2.02 FIRE ALARM SYSTEM

A. Fire Alarm System: Provide a new 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 , which is Highland Park.
   c. Applicable local codes.
   d. Contract Documents (drawings and specifications).
   e. NFPA 101.
   f. NFPA 72; where the word "should" is used consider that provision mandatory; where conflicts between requirements require deviation from NFPA 72, identify deviations clearly on design documents.
4. Evacuation Alarm: Multiple smoke zones; allow for evacuation notification of any individual zone or combination of zones, in addition to general evacuation of entire premises.
5. Voice Notification: Provide emergency voice/alarm communications with multichannel capability; digital.
6. General Evacuation Zones: Each smoke zone is considered a general evacuation zone unless otherwise indicated, with alarm notification in all zones on the same floor, on the floor above, and the floor below.
7. Program notification zones and voice messages as directed by Owner.
8. Fire Command Center: Location indicated on drawings.
9. Fire Alarm Control Unit: New, located at fire command center.

B. Supervising Stations and Fire Department Connections:
   1. Public Fire Department Notification: By on-premises supervising station.

C. Circuits:
   1. Initiating Device Circuits (IDC): Class B, Style A.
   2. Signaling Line Circuits (SLC) Within Single Building: Class B, Style 0.5.
   3. Notification Appliance Circuits (NAC): Class B, Style W.

D. Spare Capacity:
   1. Initiating Device Circuits: Minimum 25 percent spare capacity.
   2. Notification Appliance Circuits: Minimum 25 percent spare capacity.
   3. Speaker Amplifiers: Minimum 25 percent spare capacity.
   4. Fire Alarm Control Units: Capable of handling all circuits utilized to capacity without requiring additional components other than plug-in control modules.

E. Power Sources:
   1. Primary: Dedicated branch circuits of the facility power distribution system.
   2. Secondary: Storage batteries.
   3. Capacity: Sufficient to operate entire system for period specified by NFPA 72.

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 FIRE SAFETY SYSTEMS INTERFACES

A. Supervision: Provide supervisory signals in accordance with NFPA 72 for the following:
   1. Sprinkler water control valves.

2. Dry-pipe sprinkler system pressure.
3. Dry-pipe sprinkler valve room low temperature.
4. Elevator shut-down control circuits.

B. Alarm: Provide alarm initiation in accordance with NFPA 72 for the following:
1. Sprinkler water flow.
2. Elevator lobby, elevator hoistway, and elevator machine room smoke detectors.
3. Generator room heat detector.
4. Duct smoke detectors.

C. Elevators:
1. Elevator lobby, hoistway, and machine room smoke detectors: Elevator recall for fire fighters' service.
2. Elevator Machine Room Heat Detector: Shut down elevator power prior to hoistway sprinkler activation.
3. Sprinkler pressure or waterflow: Shut down elevator power prior to hoistway sprinkler activation.

D. HVAC:
1. Duct Smoke Detectors: Close dampers indicated; shut down air handlers indicated.

2.05 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. 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. Manual Pull Stations: _____.
3. Smoke Detectors: _____.
4. Duct Smoke Detectors: _____.
5. Heat Detectors: _____.

D. Notification Appliances:
1. Bells <>.
2. Speakers <>.
3. Strobes <>.

E. Circuit Conductors: Copper or optical fiber; provide 200 feet (60 m) extra; color code and label.

F. Surge Protection: In accordance with IEEE C62.41.2 category B combination waveform and NFPA 70; except for optical fiber conductors.
1. Equipment Connected to Alternating Current Circuits: Maximum let through voltage of 350 V(ac), line-to-neutral, and 350 V(ac), line-to-line; do not use fuses.
2. Initiating Device Circuits, Notification Appliance Circuits, and Communications Circuits: Provide surge protection at each point where circuit exits or enters a building; rated to protect applicable equipment; for 24 V(dc) maximum dc clamping voltage of 36 V(dc), line-to-ground, and 72 V(dc), line-to-line.
3. Signaling Line Circuits: Provide surge protection at each point where circuit exits or enters a building, rated to protect applicable equipment.

G. Locks and Keys: Deliver keys to Owner.
   1. Provide the same standard lock and key for each key operated switch and lockable panel and cabinet; provide 5 keys of each type

H. Instruction Charts: Printed instruction chart for operators, showing steps to be taken when a signal is received (normal, alarm, supervisory, and trouble); easily readable from normal operator's station.
   1. Frame: Stainless steel or aluminum with polycarbonate or glass cover.
   2. Provide one for each control unit where operations are to be performed.
   3. Obtain approval of Owner prior to mounting; mount in location acceptable to Owner.
   4. Provide extra copy with operation and maintenance data submittal.

I. Storage Cabinet for Spare Parts and Tools: Steel with baked enamel finish, size appropriate to quantity of parts and tools.
   1. Padlock eye and hasp for lock furnished by Owner.
   2. Locate as directed by Owner.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with applicable codes, NFPA 72, 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.

H. Diagnostic Period: After successful completion of inspections and tests, Operate system in normal mode for at least 14 days without any system or equipment malfunctions.
   1. Record all system operations and malfunctions.
   2. If a malfunction occurs, start diagnostic period over after correction of malfunction.
   3. Owner will provide attendant operator personnel during diagnostic period; schedule training to allow Owner personnel to perform normal duties.
   4. At end of successful diagnostic period, fill out and submit NFPA 72 "Inspection and Testing Form."

3.03 OWNER PERSONNEL INSTRUCTION

A. Provide the following instruction to designated Owner personnel:
   1. Hands-On Instruction: On-site, using operational system.
   2. Classroom Instruction: Owner furnished classroom, on-site or at other local facility.
   3. Factory Instruction: At control unit manufacturer's training facility.

B. Administrative: One-hour session(s) covering issues necessary for non-technical administrative staff; classroom:
   1. Initial Training: 1 session pre-closeout.
   2. Refresher Training: 1 session post-occupancy.

C. Basic Operation: One-hour sessions for attendant personnel, security officers, and engineering staff; combination of classroom and hands-on:
   1. Initial Training: 1 session pre-closeout.
   2. Refresher Training: 1 session post-occupancy.

D. Detailed Operation: Two-hour sessions for engineering staff; assume NICET level I qualifications or equivalent; combination of classroom and hands-on:
   1. Initial Training: 1 session pre-closeout.
   2. Refresher Training: 1 session post-occupancy.

E. Maintenance Technicians: Detailed training for electrical technicians, on programming, maintaining, repairing, and modifying; factory training:
   1. Initial Training: One 3-day session, pre-closeout.
   2. Refresher Training: One 1-day session post-occupancy.

F. Furnish the services of instructors and teaching aids; have copies of operation and maintenance data available during instruction.

G. Provide means of evaluation of trainees suitable to type of training given; report results to Owner.

3.04 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.

B. Substantial Completion of the project cannot be achieved until inspection and testing is successful and:
   1. Specified diagnostic period without malfunction has been completed.
   2. Approved operating and maintenance data has been delivered.
   3. Spare parts, extra materials, and tools have been delivered.
   4. All aspects of operation have been demonstrated to Owner.
   5. Final acceptance of the fire alarm system has been given by authorities having jurisdiction.
   6. Occupancy permit has been granted.
   7. Specified pre-closeout instruction is complete.

C. Perform post-occupancy instruction within 3 months after Substantial Completion.

3.05 MAINTENANCE

A. See Section 017000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

B. Provide to Owner, at no extra cost, a written maintenance contract for entire manufacturer's warranty period, to include the work described below.

C. Perform routine inspection, testing, and preventive maintenance required by NFPA 72, including:

1. Maintenance of fire safety interface and supervisory devices connected to fire alarm system.
2. Repairs required, unless due to improper use, accidents, or negligence beyond the control of the maintenance contractor.
3. Record keeping required by NFPA 72 and authorities having jurisdiction.

D. Provide trouble call-back service upon notification by Owner:
1. Provide on-site response within 2 hours of notification.
2. Include allowance for call-back service during normal working hours at no extra cost to Owner.
3. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

E. Provide a complete description of preventive maintenance, systematic examination, adjustment, cleaning, inspection, and testing, with a detailed schedule.

F. Maintain a log at each fire alarm control unit, listing the date and time of each inspection and call-back visit, the condition of the system, nature of the trouble, correction performed, and parts replaced. Submit duplicate of each log entry to Owner's representative upon completion of site visit.

G. Comply with Owner's requirements for access to facility and security.

END OF SECTION