

**SECTION 00 0101
PROJECT TITLE PAGE**

**PROJECT MANUAL
FOR
MCVSD Middle School Auditoriums - Auditorium Electrical and Rigging Upgrades**

Owner:

MOLINE-COAL VALLEY SCHOOL DISTRICT #40
1616 11TH AVENUE
MOLINE, IL 61265

Moline-Coal Valley School District #40

JOHN DEERE MIDDLE SCHOOL
2035 11TH STREET
MOLINE, IL 61265

WILSON MIDDLE SCHOOL

1301 48TH STREET
MOLINE, IL 61265

ARCHITECT/ENGINEER:

SHIVE-HATTERY, INC.
2144 56TH AVENUE WEST
BETTENDORF, IA 52722
ILLINOIS FIRM NO. 184-000214

BIDS DUE:

JUNE 13, 2023
02:00 PM
MOLINE-COAL VALLEY SCHOOL DISTRICT ADMINISTRATION BUILDING
1619 11TH AVENUE, MOLINE IL 61265

MANDATORY PREBID MEETING:

MAY 31, 2023
2:00 PM
JOHN DEERE MIDDLE SCHOOL, 2035 11TH STREET, FOLLOWED BY TRIP TO WILSON MIDDLE
SCHOOL - 1301 48TH STREET

ISSUED FOR BID:

MAY 19, 2023

END OF SECTION

**SECTION 00 0102
PROJECT INFORMATION**

PART 1 GENERAL

1.1 PROJECT IDENTIFICATION

- A. Project Name: MCVSD Middle School Auditoriums - Auditorium Electrical and Rigging Upgrades, located at:
 - 1. John Deere Middle School
 - 2. Wilson Middle School
- B. The Owner, hereinafter referred to as Owner: Moline-Coal Valley School District #40

1.2 PROJECT DESCRIPTION

- A. Summary Project Description: The project includes the removal and replacement of theatre and house lighting, new rigging, motorized winches and lighting control at John Deere and Wilson Middle Schools..

1.3 PROCUREMENT TIMETABLE

- A. The Owner reserves the right to change the schedule or terminate the entire procurement process at any time.

1.4 PROCUREMENT DOCUMENTS

- A. Availability of Documents: Complete sets of procurement documents may be obtained:
 - 1. The owners Bids/RFPs website: <https://www.molineschools.org/>
 - a. Drawings are located under the "District" tab and the "Bids/RFPs" section.

PART 2 PRODUCTS (NOT USED)

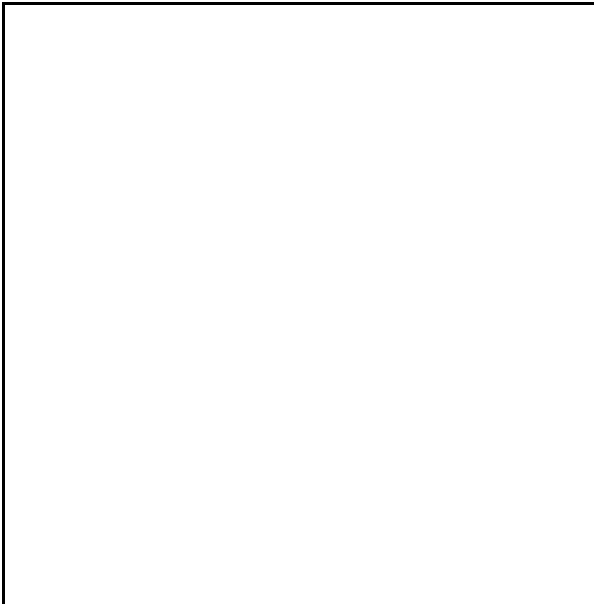
PART 3 EXECUTION (NOT USED)

END OF SECTION

MCVSD Middle School Auditoriums - Auditorium Electrical and Rigging Upgrades	
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**SECTION 00 0105
CERTIFICATIONS PAGE**

**Shive-Hattery, Inc.
State of Illinois License No. 184-000214**



END OF SECTION

MCVSD Middle School Auditoriums - Auditorium Electrical and Rigging Upgrades	
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**SECTION 00 0110
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**SECTION 00 0115
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END OF SECTION

MCVSD Middle School Auditoriums - Auditorium Electrical and Rigging Upgrades	
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**SECTION 00 1113
ADVERTISEMENT FOR BIDS**

**PROJECT: MCVSD MIDDLE SCHOOL AUDITORIUMS - AUDITORIUM ELECTRICAL AND RIGGING
UPGRADES**

1.1 MOLINE, IL

A. BIDS DUE: June 13, 2023 at 2:00 PM

B. TO: **Owner (HEREINAFTER REFERRED TO AS Owner):**

Moline-Coal Valley School District #40, 1619 11th Avenue, Moline, IL 61265

C. Architect (hereinafter referred to as Architect):

2144 56th Avenue West, Bettendorf, IA 52722

D. MANDATORY PREBID MEETING:

May 31, 2023 at 2:00 PM

John Deere Middle School - 2035 11th Street; Meeting will include a trip to Wilson Middle School

E. TO: POTENTIAL BIDDERS

1. Sealed bids will be received by the Owner at Moline-Coal Valley School District Administration Building until 02:00 PM, Central Time, on June 13, 2023.
2. Sealed bids will be opened and publicly read at the Moline-Coal Valley School District Administration Building at 02:00 PM , Central Time, on June 13, 2023 or at such later time and place as may then be fixed.
3. The general nature of the work is as follows:
The project includes the removal and replacement of theatre and house lighting, new rigging, motorized winches and lighting control at John Deere and Wilson Middle Schools.
4. Bidding documents may be examined at the Moline School District's office or online at: www.molineschools.org.
5. Copies of the Bidding documents may be obtained by Bidders and Sub-bidders through the Moline School District's website (www.molineschools.org), under "Bids/RFPs" section. There is no deposit.
6. Each Bidder shall accompany the bid with a bid security, in a separate envelope, as security that the successful Bidder will enter into a Contract for the work bid upon and will furnish after the award of the Contract, a corporate surety bond or bonds, acceptable to the Owner, for the faithful performance of the Contract, in an amount equivalent to 100% of the amount of the Contract. The Bidder's security shall be in an amount equivalent to 10% of the Bid Amount, and shall be in the form of a cashier's or certified check drawn on a bank in Illinois or a bank chartered under the laws of the United States, or a certified share draft drawn on a credit union in Illinois or chartered under the laws of the United States or a bid bond from a corporate surety satisfactory to the Owner. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty. The amount of the bid security shall not be forfeited to the Owner in the event the Owner fails to comply with Paragraph 6.2. Bid security of the successful bidder will be held by the Owner until an Agreement is fully executed and bonds are received and acceptable to the Owner.
7. No bid may be withdrawn for a period of 30 days after the date of the scheduled closing time for the receipt of bids.
8. It is the intent of the Owner to award a contract to the lowest responsible, responsive bidder provided the bid has been submitted in accordance with the bidding requirements. The Owner reserves the right to waive informalities or irregularities. The Owner reserves the right to reject any or all bids.
9. Published by order of the Board of Education of the Moline-Coal Valley School District in Moline, IL.

END OF SECTION

MCVSD Middle School Auditoriums - Auditorium Electrical and Rigging

Upgrades

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**SECTION 00 2115
SUPPLEMENTAL INSTRUCTIONS TO BIDDERS**

ARTICLE 1: DEFINITIONS

NO SUPPLEMENTS

ARTICLE 2: BIDDER'S REPRESENTATIONS

ADD THE FOLLOWING SUBPARAGRAPHS TO PARAGRAPH 2.1:

2.1.5 Work shall commence once determined after bid is awarded.

ARTICLE 3: BIDDING DOCUMENTS

DELETE SUBPARAGRAPH 3.1.1 AND SUBSTITUTE THE FOLLOWING SUBPARAGRAPH 3.1.1:

ADD SUBPARAGRAPHS 3.3.5 AS FOLLOWS:

3.3.5 Substitution requests must be submitted by prospective bidders on 00 4325 - Substitution Request Form. Substitution requests from manufacturers, distributors, or other entities that are not bidding as a general contractor will be rejected without review.

DELETE SUBPARAGRAPH 3.4.3 AND REPLACE WITH THE FOLLOWING:

3.4.3 Addenda will be issued in order to be received by all planholders of record not less than 48 Hours prior to the date and time that bids are due, except an addendum withdrawing the Request for Bids or one which includes postponement of the date for receipt of bids.

ARTICLE 4: BIDDING PROCEDURES

4.1 PREPARATION OF BIDS

ADD THE FOLLOWING SUBPARAGRAPH 4.1.8:

A. 4.1.8 This Project is exempt from State and local sales and use taxes on sales of building materials and fixtures to construction contractors for incorporation into real estate for governmental bodies of the State of Illinois.

ADD THE FOLLOWING SUBPARAGRAPH 4.1.9:

4.1.9 The Contractor shall take note and comply with all governing laws, rules, and regulations affecting the Work. This may include such laws, rules, and regulations as:

4.1.9.1. Licensing of Contractors for special requirements, e.g. hazardous waste removal.

4.1.9.2. Requirements for special construction permits.

4.1.9.3. Exemption from sales tax, if applicable.

4.1.9.4. Wage rates and employment requirements when required by law or by Owner.

4.1.9.5. Local labor requirements.

4.1.9.6. Non-discriminatory hiring practices.

4.1.9.7. Targeted small business participation.

4.1.9.8. Women-owned Business Enterprises / Minority-owned Business Enterprises (WBE/MBE) requirements.

4.2 BID SECURITY

DELETE SUBPARAGRAPH 4.2.1 AND SUBSTITUTE THE FOLLOWING SUBPARAGRAPH:

4.2.1 Each Bidder shall accompany the bid with a bid security, in a separate envelope, as security that the successful Bidder will enter into a Contract for the work bid upon and will furnish after the award of the Contract, a corporate surety bond or bonds, acceptable to the Owner, for the faithful performance of the Contract, in an amount equivalent to 100% of the amount of the Contract. The Bidder's security shall be in an amount equivalent to 10% of the Bid Amount, and shall be in the form of a cashier's or certified check drawn on a bank in Illinois or a bank chartered under the laws of the United States, or a certified share draft drawn on a credit union in Illinois or chartered under the laws of the United States or a bid bond from a corporate surety satisfactory to the Owner. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty. The amount of the bid security shall not be forfeited to the Owner in the event the Owner fails to comply with Paragraph 6.2. Bid security of the successful bidder will be held by the Owner until an Agreement is fully executed and bonds are received and acceptable to the Owner.

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4.3 SUBMISSION OF BIDS

DELETE SUBPARAGRAPH 4.3.1 AND SUBSTITUTE THE FOLLOWING SUBPARAGRAPHS 4.3.1 AND SUBPARAGRAPH(S):

4.3.1 All copies of the Bid and other documents, not including the bid security, required to be submitted with the Bid, shall be enclosed in a sealed opaque envelope. The bid security, if any, shall be submitted in a separate sealed opaque envelope. Each envelope shall bear the return address of the bidder and shall be addressed as follows:

TO: Owner

Address: Moline-Coal Valley School District Administration Building, 1619 11th Avenue, Moline IL 61265; Attn: Business Office.

BID FOR: MCVSD Middle School Auditoriums - Auditorium Electrical and Rigging Upgrades

or as applicable:

BID SECURITY FOR: MCVSD Middle School Auditoriums - Auditorium Electrical and Rigging Upgrades

4.3.1.1 If the Bid, the bid security, if any, and other documents required to be submitted with the Bid are sent by mail, the sealed envelopes shall be enclosed in a separate mail envelope with the notation "SEALED BID ENCLOSED" on the face thereof.

4.4 MODIFICATION OR WITHDRAWAL OF BID

ADD SUBPARAGRAPH 4.4.1.1 AS FOLLOWS:

4.4.1.1 The specific time period during which Bids may not be withdrawn shall be as stated on the Bid Form bound herein.

ADD ARTICLE 4.5 PRE-BID CONFERENCE AS FOLLOWS:

4.5 PRE-BID CONFERENCE

4.4.5 The Advertisement for Bid includes notification of a mandatory pre-bid conference for the purpose of answering questions and providing information to prospective Bidders. The pre-bid conference will be held at John Deere Middle School - 2035 11th Street, followed by a trip to Wilson Middle School - 1301 48th Street, on May 31, 2023 at 2:00 PM.

ADD THE SUBPARAGRAPH 4.5.1 AS FOLLOWS:

4.5.1 If the Bidder is not on record as having attended the mandatory pre-bid conference the bid will be returned unopened based on failure to meet these requirements.

ARTICLE 5: CONSIDERATION OF BIDS

5.1 OPENING OF BIDS

PARAGRAPH 5.1 NO SUPPLEMENTS

DELETE SUBPARAGRAPH 5.3.1 AND SUBSTITUTE THE FOLLOWING SUBPARAGRAPH:

5.3.1 It is the intent of the Owner to award a contract or multiple contracts to the lowest responsible, responsive Bidder(s) provided the Bid(s) has/have been submitted in accordance with the requirements of the Bidding Documents and does/do not exceed the funds available. The Owner shall have the right to waive informalities and irregularities in a Bid or Bids received and to accept the Bid(s) which, in the Owner's judgment, is/are in the Owner's best interests.

ARTICLE 6: POST-BID INFORMATION

ADD SUBPARAGRAPH 6.1.1 AS FOLLOWS:

6.1.1 Out-of-state-bidders shall furnish documentation prior to execution of the Agreement that confirms the Bidder is in compliance with [Chapter 805, Act 5, Article 13. Foreign Corporations, Section 5/13.15 Application for Certificate of Authority of the Illinois Compiled Statutes, and legally authorized to carry on business in the State of Illinois.

ARTICLE 7: PERFORMANCE BOND AND PAYMENT BOND

No Supplements.

ARTICLE 8: FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

ADD THE FOLLOWING PARAGRAPH 8.1 EXECUTION OF AGREEMENT:

8.1 The selected Bidder shall, within ten (10) calendar days after receipt of Notice of Award, sign and deliver the required number of executed counterparts of the Agreement along with any required attached documents. Within ten (10) calendar days after receipt of executed documents from the selected Bidder, the Owner shall deliver one fully executed counterpart to the Contractor.

END OF SECTION

SECTION 00 2115.02
INSTRUCTIONS TO BIDDERS PROPOSED SUBCONTRACTORS AND MATERIAL/EQUIPMENT
SUPPLIERS

PROJECT: MCVSD Middle School Auditoriums - Auditorium Electrical and Rigging Upgrades

A/E: SHIVE-HATTERY, INC.

OWNER: MOLINE-COAL VALLEY SCHOOL DISTRICT #40

CONTRACTOR: _____

BY: _____

DATE: _____

PROPOSED CONTRACTORS - List all persons or entities for each principal portion of the work, including those who are to furnish material or equipment. Attach additional pages, if necessary.

Description of Work Materials or Equipment	Name of Subcontractor or Materials/Equipment Supplier

END OF SECTION

**SECTION 00 4100
BID FORM**

**PROJECT: MCVSD MIDDLE SCHOOL AUDITORIUMS ELECTRICAL / LIGHTING UPGRADES
JOHN DEERE MIDDLE SCHOOL AND WILSON MIDDLE SCHOOL**

BID TO:	MOLINE-COAL VALLEY SCHOOL DISTRICT #40
	1619 11TH AVENUE, MOLINE, IL 61265
DELIVER BID TO:	MCVSD ADMINISTRATION BUILDING

SUBMITTED BY: _____
(BIDDER TO ENTER NAME AND ADDRESS)

Bidder's Full Name _____

Address _____

City, State, Zip _____

NOTE: Submit one original of this Bid Form. All blanks shall be completed. Only bids on this form will be accepted. Submit Bid Security, if required, in separate envelope. Bidder shall carefully review the Instructions to Bidders and Supplementary Instructions to Bidders prior to completing this form.

The undersigned BIDDER proposes and agrees, if this Bid is accepted, to enter into an agreement with OWNER in the form included in the Contract Documents to perform and furnish all Work as specified or indicated in the Contract Documents for the Bid Price and within the schedule indicated in this Bid and in accordance with the other terms and conditions of the Contract Documents. Bidder accepts all of the terms and conditions of the Advertisement for Bids and Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 30 days after the day of Bid opening. The undersigned Bidder submits, herewith, bid security in accordance with the terms set forth in the Advertisement for Bids and Supplementary Instructions to Bidders.

The Bidder has examined and carefully studied the Bidding Documents and the following Addenda, receipt of all which is hereby acknowledged:

<u>DATE</u>	<u>NUMBER</u>

BIDDER has visited the site and become familiar with and is satisfied as to the general, local and site conditions that may affect cost, progress, performance and furnishing of the Work.

BIDDER is familiar with and is satisfied as to all federal, state and local Laws and Regulations that may affect cost, progress, performance and furnishing of the Work.

BIDDER will complete the Work in accordance with the Contract Documents for the following bid price(s):

BASE BID	_____	\$	_____
	(USE WORDS)		(USE FIGURES)
ALTERNATE BID #1: WILSON STAGE RIGGING			
	_____	\$	_____
	(USE WORDS)		(USE FIGURES)
ALTERNATE BID #2: JOHN DEERE STAGE RIGGING			
	_____	\$	_____
	(USE WORDS)		(USE FIGURES)

- A. BIDDER agrees that the Work will be completed in accordance with the project schedule in the Advertisement for Bids.
- B. BIDDER accepts the provisions of the Agreement as to liquidated damages in the event of failure to complete the Work within the times specified in the Agreement.

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- C. Bidder certifies that this proposal is made in good faith, without collusion or in connection with any other person, organization, or corporation bidding on the work.
- D. The following documents are attached to and made a condition of this Bid:
 - 1. Required Bid Security in the amount of _____ and in the form of _____.
SUBMITTED IN A SEPARATE ENVELOPE.
 - 2. Schedule of Bid Prices.
 - 3. A tabulation of Subcontractors, Suppliers and other persons and organizations required to be identified in this Bid (on Bidder's letterhead).
 - 4. Bidder Eligibility Certificate.
 - 5. Non-Collusion Affidavit.
 - 6. Vendor Information Form
 - 7. List of Area References
 - 8. Certificate Regarding Criminal Background Investigations
 - 9. Authorization for Criminal Background Investigation
 - 10. Project Schedule
 - 11. Assurance Schedules B, D, F, G, H, and I.
 - 12. This Bid submitted on _____, 2023.
 - 13. State Contractor License No. _____.
 - 14. The bidder shall not make any revisions to the bid forms or the Schedule of Bid Prices and shall not devise any alternates other than those provided. Any such notes, revisions, or comments shall be grounds for rejection of the bid as not being responsive.
 - 15. Complete the applicable item(s) listed below. If this Bid is submitted by an agent of BIDDER, attach a current Power-of-Attorney certifying the agent's authority to bind the BIDDER.

If BIDDER IS:

An Individual:

By: _____
(signature of individual) (typed or printed name)
doing business as: _____
Business Address: _____
Phone No. _____

A Partnership:

By: _____
(Firm Name)

(signature of general partner) (typed or printed name)
Business Address: _____
Phone No. _____

A Corporation:

By: _____
(Corporation Name)
State of Incorporation: _____
By: _____
(signature of person authorized to sign)

(typed or printed name and title)
Attest: _____
(Secretary)
Business Address: _____
Phone No. _____

END OF SECTION

**SECTION 00 4325
SUBSTITUTION REQUEST FORM**

REFERENCE: AIA A701 Instructions to Bidders Subparagraph 3.3

NOTE: SUBSTITUTION REQUESTS MUST BE RECEIVED BY THE ARCHITECT 10 DAYS PRIOR TO THE RECEIPT OF BIDS.

PROJECT: MCVSD MIDDLE SCHOOL AUDITORIUMS - AUDITORIUM ELECTRICAL AND RIGGING UPGRADES A/E: SHIVE-HATTERY, INC.

BIDDER: _____

BY: _____

DATE: _____

SPECIFIED MATERIAL, PRODUCT OR EQUIPMENT: _____

RELATED SPECIFICATION SECTIONS: _____

RELATED DRAWING NUMBERS: _____

PROPOSED SUBSTITUTION: _____

REASON FOR PROPOSED SUBSTITUTION: _____

ATTACHED DATA: REFER TO AIA INSTRUCTIONS TO BIDDERS (AIA A701-1997) SUBPARAGRAPH 3.3 SUBSTITUTIONS FOR REQUIREMENTS. ATTACH ADDITIONAL PAGES, IF NECESSARY.

<u>Item No.</u>	<u>Description</u>

For Use by the Architect

Substitution:	<input type="checkbox"/>	Approved	<input type="checkbox"/>	Not Approved
	<input type="checkbox"/>	Approved As Noted	<input type="checkbox"/>	Not Approve - Received too Late

END OF SECTION

MCVSD Middle School Auditoriums - Auditorium Electrical and Rigging Upgrades	
Project #318444-2	00 4325-1

**SECTION 00 5000
CONTRACTING FORMS AND SUPPLEMENTS**

PART 1 GENERAL

- 1.1 WHERE IT IS PROVIDED IN THE BID DOCUMENTS THAT THE CONTRACTOR SHALL USE AIA DOCUMENTS, THEY ARE HEREBY MADE A PART OF THESE DOCUMENTS TO THE SAME EXTENT AS IF BOUND HEREIN. AIA FORMS MAY BE PURCHASED FROM THE AMERICAN INSTITUTE OF ARCHITECTS AT WWW.AIA.ORG.
- 1.2 AGREEMENT AND CONDITIONS OF THE CONTRACT
 - A. See Section 00 7300 - Supplementary Conditions for the Supplementary Conditions.
 - B. The Agreement is based on AIA A101.
 - C. The General Conditions are based on AIA A201.
- 1.3 FORMS
 - A. Use the following forms for the specified purposes unless otherwise indicated elsewhere in the Contract Documents.
 - B. Bond Forms:
 - 1. Performance and Payment Bond Form: AIA A312.
 - C. Post-Award Certificates and Other Forms:
 - 1. Schedule of Values Form: AIA G703.
 - 2. Application for Payment Forms: AIA G702 with AIA G703 (for Contractors).
 - D. Clarification and Modification Forms:
 - 1. Construction Change Directive Form: AIA G714.
 - 2. Change Order Form: AIA G701.
 - E. Closeout Forms:
 - 1. Certificate of Substantial Completion Form: AIA G704.
- 1.4 REFERENCE STANDARDS
 - A. AIA A101 - Standard Form of Agreement Between Owner and Contractor where the basis of Payment is a Stipulated Sum 2017.
 - B. AIA A201 - General Conditions of the Contract for Construction 2017.
 - C. AIA A312 - Performance Bond and Payment Bond 2010.
 - D. AIA G701 - Change Order 2017.
 - E. AIA G702 - Application and Certificate for Payment 1992.
 - F. AIA G703 - Continuation Sheet 1992.
 - G. AIA G704 - Certificate of Substantial Completion 2017.
 - H. AIA G714 - Construction Change Directive 2017.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

MCVSD Middle School Auditoriums - Auditorium Electrical and Rigging Upgrades	
Project #318444-2	00 5000-1

**SECTION 01 1000
SUMMARY**

PART 1 GENERAL

1.1 PROJECT

- A. Project Name: MCVSD Middle School Auditoriums - Auditorium Electrical and Rigging Upgrades
- B. Owner's Name: Moline-Coal Valley School District #40
- C. Architect's Name: Shive-Hattery, Inc.
- D. The Project consists of the removal and replacement of theater and house lighting, new rigging, motorized winches, and lighting control at John Deere Middle School and Wilson Middle School.

1.2 CONTRACT DESCRIPTION

- A. Contract Type: A single prime contract based on a Stipulated Price as described in Document 00 5200 - Agreement Form.

1.3 OWNER OCCUPANCY

- A. Owner intends to continue to occupy adjacent portions of the existing building during the entire construction period. Perform the Work so as not to interfere with Owner's day-to-day operations. Maintain existing exits, unless otherwise indicated.
 - 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
 - 2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.
- B. Owner intends to occupy the Project by the date stated in the Agreement as the contract completion date.
- C. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.
- D. Schedule the Work to accommodate Owner occupancy.

1.4 CONTRACTOR USE OF SITE AND PREMISES

- A. Construction Operations: Limited to areas noted on Drawings. Use of Site: Limit use of premises to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
- B. Arrange use of site and premises to allow:
 - 1. Owner occupancy. Allow for Owner occupancy of Project site and use by the public.
 - 2. Use of site and premises by the public.
- 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.
 - 3. Driveways and Entrances: Keep driveways, parking garage, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, or emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- D. Existing building spaces may not be used for storage except for areas designated on the drawings.
- E. Use of Existing Building: Maintain existing building in a weathertight condition throughout construction period. Repair damage caused by construction operations. Protect building and its occupants during construction period.
- F. Time Restrictions: Work shall be generally performed inside the existing building during normal business working hours of 7:00 a.m. to 5:00 p.m., Monday through Friday, except otherwise indicated.
 - 1. Weekend Hours: Will be permitted upon written request and authorization by the Owner
 - 2. Outside Normal Business Hours: Will be permitted upon written request and authorization by the Owner.

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G. Utility Outages and Shutdown:

1. Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
2. Limit disruption of utility services to hours the building is unoccupied.
3. Do not disrupt or shut down life safety systems, including but not limited to fire sprinklers and fire alarm system, without 7 days notice to Owner and authorities having jurisdiction.
4. Prevent accidental disruption of utility services to other facilities.
5. Notify Owner not less than two days in advance of proposed utility interruptions.
6. Do not proceed with utility interruptions without Owner's written permission.

1.5 WORK SEQUENCE AND PHASING

- A. Coordinate construction schedule and operations with Owner. Before commencing Work of each phase, submit a schedule showing the sequence, commencement and completion dates, and move-out and -in dates of Owner's personnel for all phases of the Work.

1.6 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the 50-division format and CSI/CSC's "MasterFormat" numbering system.
1. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.
 2. Division 01: Sections in Division 01 govern the execution of the Work of all Sections in the Specifications.
- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
 2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
 - a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

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**SECTION 01 2000
PRICE AND PAYMENT PROCEDURES**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Procedures for preparation and submittal of applications for progress payments.
- B. Procedures for preparation and submittal of application for final payment.

1.2 RELATED REQUIREMENTS

- A. Section 00 5000 - Contracting Forms and Supplements: Forms to be used.
- B. Document 00 5200 - Agreement Form: Contract Sum, retainages, payment period, monetary values of unit prices.
- C. Document 00 7200 - General Conditions and Document 00 7300 - Supplementary Conditions: Additional requirements for progress payments, final payment, changes in the Work.
- D. Document 00 7300 - Supplementary Conditions: Percentage allowances for Contractor's overhead and profit.

1.3 DEFINITIONS

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

1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
- B. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
 - 1. Application for Payment forms with Continuation Sheets.
- C. Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.
- D. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.
- E. Forms filled out by hand will not be accepted.
- F. Submit Schedule of Values to Architect at earliest possible date but no later than 7 days after date
- G. Revise schedule to list approved Change Orders, with each Application For Payment.
- H. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate. Include separate line items under required principal subcontracts for operation and maintenance manuals, punch list activities, Project Record Documents, and demonstration and training in the amount of 5 percent of the Contract Sum.
- I. Round amounts to nearest whole dollar; total shall equal the Contract Sum.

1.5 APPLICATIONS FOR PROGRESS PAYMENTS

- A. Payment Period: Submit at intervals stipulated in the Agreement.
- B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit sample to Architect for approval.
- C. Forms filled out by hand will not be accepted.
- D. Execute certification by signature of authorized officer.
- E. Submit three copies of each Application for Payment.
- F. Include the following with the application:
 - 1. Transmittal letter as specified for Submittals in Section 01 3000. Submit 3 signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
 - 2. Partial release of liens from major Subcontractors and vendors.

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- a. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from every entity who is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
 - 1) Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 - 2) When an application shows completion of an item, submit final or full waivers.
 - 3) Owner reserves the right to designate which entities involved in the Work must submit waivers.
 - 4) Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.
 - b. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.
 - 1) Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 - 2) When an application shows completion of an item, submit final or full waivers.
 - 3) Owner reserves the right to designate which entities involved in the Work must submit waivers.
 - 4) Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
 - G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
 - 1. List of subcontractors.
 - 2. Schedule of Values.
 - 3. Contractor's Construction Schedule (preliminary if not final).
 - 4. Initial progress report.
 - 5. Report of preconstruction conference.
 - 6. Certificates of insurance and insurance policies.
 - 7. Performance and payment bonds.
 - 8. Data needed to acquire Owner's insurance.
 - H. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
 - 1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 - 2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
 - I. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
 - 1. Evidence of completion of Project closeout requirements.
 - 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 - 3. Updated final statement, accounting for final changes to the Contract Sum.
 - 4. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
 - 5. Evidence that claims have been settled.
 - 6. Final, liquidated damages settlement statement.
- 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:

Price and Payment Procedures

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1. All closeout procedures specified in Section 01 7000.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

**SECTION 01 2100
ALLOWANCES**

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Contingency allowance.

1.2 RELATED REQUIREMENTS

A. Section 01 2000 - Price and Payment Procedures: Additional payment and modification procedures.

1.3 CONTINGENCY ALLOWANCE

A. Contractor's costs for products, delivery, installation, labor, insurance, payroll, taxes, bonding, equipment rental, overhead and profit will be included in Change Orders authorizing expenditure of funds from this Contingency Allowance.

B. Funds will be drawn from the Contingency Allowance only by Change Order.

C. At closeout of Contract, funds remaining in Contingency Allowance will be credited to Owner by Change Order.

1.4 ALLOWANCES SCHEDULE

A. Contingency Allowance: Include the stipulated sum/price of \$7,500 for use upon Owner's instructions at John Deere Middle School.

B. Contingency Allowance: Include the stipulated sum/price of \$7,500 for use upon Owner's instructions at Wilson Middle School.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

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**SECTION 01 2600
CONTRACT MODIFICATION PROCEDURES**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Minor Changes in the Work
- B. Proposal Requests
- C. Change Order Procedures
- D. Construction Change Directive

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.

1.3 MINOR CHANGES IN THE WORK

- A. Architect will issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, as a Software Generated "Architect's Supplemental Instruction".

1.4 PROPOSAL REQUESTS

- A. Proposal Requests: Architect will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Proposal Requests issued by Architect are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
 - 2. Within time specified in Proposal Request after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
- B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to Architect.
 - 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
 - 2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - 3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - 4. Include costs of labor and supervision directly attributable to the change.
 - 5. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 - 6. Comply with requirements in Division 01 Section 01 6000 "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.
 - 7. Proposal Request Form: Use AIA Document G709 for Proposal Requests.
- C. Stipulated Sum/Price Change Order: Based on Proposal Request and Contractor's fixed price quotation or Contractor's request for a Change Order as approved by Architect/Engineer.

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- D. Construction Change Directive: Architect/Engineer may issue a directive, on AIA Form G714 Construction Change Directive signed by the Owner, instructing the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order. Document will describe changes in the Work, and designate method of determining any change in Contract Sum/Price or Contract Time. Promptly execute the change.
- E. Time and Material Change Order: Submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract. Architect/Engineer will determine the change allowable in Contract Sum/Price and Contract Time as provided in the Contract Documents.
- F. Maintain detailed records of work done on Time and Material basis. Provide full information required for evaluation of proposed changes, and to substantiate costs for changes in the Work.
- G. Change Order Forms: AIA G701 Change Order.
- H. Execution of Change Orders: Architect/Engineer will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.

1.5 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

1.6 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
 - 1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Work Change Directive.
 - 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION 01 2600

**SECTION 01 3000
ADMINISTRATIVE REQUIREMENTS**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Electronic document submittal service.
- B. Preconstruction meeting.
- C. Progress meetings.
- D. Construction progress schedule.
- E. Submittals for review, information, and project closeout.
- F. Number of copies of submittals.
- G. Submittal procedures.
- H. Administrative and supervisory personnel
- I. Requests for information (RFI).
- J. Architect's Digital Data Files

1.2 RELATED REQUIREMENTS

- A. Document 00 7200 - General Conditions: Dates for applications for payment.
- B. Document 00 7300 - Supplementary Conditions: Duties of the Construction Manager.
- C. Section 01 1000 - Summary
- D. Section 01 6000 - Product Requirements: Form, content, and administration of schedules.
- E. Section 01 7000 - Execution and Closeout Requirements: Additional coordination requirements.
- F. Section 01 7800 - Closeout Submittals: Project record documents.

1.3 REFERENCE STANDARDS

- A. AIA G810 - Transmittal Letter 2001.

1.4 DEFINITIONS

- A. RFI: Request from Contractor seeking interpretation, information, or clarification of the Contract Documents.
- B. Action Submittals: Written and graphic information that does require Architect's responsive action.
- C. Informational Submittals: Written information that does not require Architect's responsive action. Submittals may be rejected for not complying with requirements.
- D. Delegated Design Submittals: Action Submittals, consisting of written information required for submittal to the Architect when some portion or aspect of the project will be designed by a design professional who is under contract to the Contractor.

1.5 PROJECT COORDINATION

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate operations with operations included in different Sections, that depend on each other for proper installation, connection, and operation.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
 - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 - 1. Preparation of Contractor's Construction Schedule.
 - 2. Preparation of the Schedule of Values.
 - 3. Installation and removal of temporary facilities and controls.
 - 4. Delivery and processing of submittals.
 - 5. Progress meetings.
 - 6. Preinstallation conferences.

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7. Project closeout activities.

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

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

1.6 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.

B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses, email addresses, and telephone numbers, including home, mobile, and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1.7 PROJECT MEETINGS

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

B. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.

C. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.

D. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.

1.8 REQUESTS FOR INFORMATION (RFI)

A. Procedure: Immediately on discovery of the need for information or interpretation of the Contract Documents, prepare and submit a Request for Information (RFI) in the form specified, with a necessary question regarding ambiguities or conflicts in the documents or field conditions, concealed conditions at the site, clarification of a contract requirement, dimensions, or other information for which clarification is required.

1. RFI's shall originate with Contractor, Architect, or Owner. RFIs submitted by entities other than Contractor, Architect, or Owner will be returned with no response.

2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

3. The Contractor is required to review all RFI's submitted by subcontractor's and suppliers for completeness, accuracy, validity, and justification prior to submission to the Architect. The Contractor can commonly answer subcontractor /supplier RFI's without delegation to the Architect.

4. Promptly submit any RFI's that could result in a delay of the activities on the critical path if the resolution is not obtained promptly. Provide a date on each RFI that the response is required by, in order to not have an impact on the critical path of construction activities.

5. In the case of a condition that requires a change in the work to resolve a conflict or other condition, the Contractor shall include a recommendation for resolution of the condition and submit a separate Change Order Request (COR).

6. The Architect's response to an RFI is not an authorization to proceed with work involving additional cost, time or both. If the response involves additional work the Contractor shall provide the Architect with a complete description of work added and work deleted by the response within seven (7) days of the issued date of the RFI response. If the response involves additional work for which the Contractor will seek an adjustment to the contract sum, time or both, the Contractor shall submit a cost proposal in the form of a Change Order Request (COR) to the Architect. The Contractor shall not proceed with incorporating the response into the work until a Change Order or, Construction Change Directive has been fully executed.

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7. Unless notified otherwise by the Contractor, the Architect's RFI response shall have the same effect as the Architect's order for minor changes in the Work. The Contractor will proceed with the Work, and the response will be incorporated into the contract that same as the Architect's written order for minor changes in the Work. Notify the Architect in writing if noted modifications cannot be made due to conflicting circumstances in the field, in other contract documents, or for other reasons.
 8. The Contractor shall not incorporate any language into RFI's or Change Proposals that imply future additional costs or delays beyond those fully explained within the document. The Contractor may stipulate conditions or constraints under which the pricing or time may change; however, such conditions or constraints shall not infringe on the Architect's or Owner's right to adequate time for review of the issue.
 9. The Contractor shall not submit Confirming RFI's, i.e., RFI's requesting confirmation of information already in the contract documents or previously provided, or requesting confirmation to questions previously answered or clarification previously given. Similarly the Contractor shall not submit Repetitive RFI's, i.e., RFI's, wherein the same information is requested more than once, even if phrased in another format or asked in a different manner. Confirming & Repetitive RFI's are considered frivolous.
 10. The Contractor shall not retain or suppress RFI's for group submissions. Each individual RFI is to be submitted expeditiously upon occurrence. Numerous RFI's submitted in a short time period will not be considered reasonable, and will result in review times being extended accordingly.
 11. The Contractor shall not install any components in locations other than as indicated on the contract documents unless 1) all other affected work has been reviewed and coordinated with the relocation; and 2) the relocation is the resolution for an RFI, including a statement by the Contractor that the relocation has been coordinated with other affected work.
 12. The Contractor shall not use an RFI as a means of proposing a deviation, an alternative product, arrangement, or installation for the Contractor's convenience; these proposals shall be submitted as Substitution Requests, and the RFI voided. A contractor-proposed alternative arrangement or installation submitted as an RFI will not become the subsequent basis for a claim by the contractor.
 13. The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect for evaluating and responding to:
 - a. Incomplete, illegitimate, or frivolous Contractor's requests for information and requests for information that are not prepared in accordance with the Contract Documents.
 - b. Contractor requests for information where the requested information is available to the Contractor from a careful study and comparison of the contract documents, field conditions, contractor-prepared coordination drawings, other Owner/Architect-provided information or prior project correspondence or documentation.
 - c. Contractor-proposed alternative arrangements or installations for the convenience of the contractor which, upon acceptance, requires the Architect to revise the contract documents.
- B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:
1. Project name.
 2. Date.
 3. Name of Contractor.
 4. Name of Architect.
 5. RFI number, numbered sequentially.
 6. Specification Section number and title and related paragraphs, as appropriate.
 7. Drawing number and detail references, as appropriate.
 8. Field dimensions and conditions, as appropriate.

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9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
10. Contractor's signature or review stamp.
11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing information or interpretation. Each RFI shall include sufficient detail for evaluation.
 - a. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.
- C. Software-Generated RFI's: Software-generated form with substantially the same content as indicated above.
 1. Attachments shall be electronic files in Adobe Acrobat PDF format.
- D. Architect Action: Architect will review each RFI, determine action required, and return it. Allow an average of ten working days for Architect's response for each RFI. RFI's received after 1:00 p.m. will be considered as received the following working day. Some issues may take longer for review, the recipient of the RFI shall notify the sender of the RFI if additional time is required.
 1. Architect's action may include a request for additional information, in which case Architect's time for response will start again.
 2. Architect's action on RFI's that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit a Change Proposal according to Division 01 Section "Contract Modification Procedures."
- E. RFI Log: RFI Log will be maintained on the Newforma Info Exchange Site provided by the Architect. The software/site will be used to generate, transmit, log, and receive RFIs and RFI responses on the project. The RFI Log can be exported from the site and used to communicate with other project team members. Software log with not less than the following:
 1. Project name.
 2. Name and address of Contractor.
 3. Name and address of Architect.
 4. RFI number including RFIs that were dropped and not submitted.
 5. RFI description.
 6. Date the RFI was submitted.
 7. Date Architect response was received.
 8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
 9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

1.9 ARCHITECT'S DIGITAL DATA FILES

- A. General: The Architect will provide digital data files of the contract drawings to the Contractor for use in preparing submittals.
 1. The Architect makes no representations as to the accuracy or completeness of digital data files as they relate to the Contract Drawings.
 2. The digital data files are available in AutoCAD (dwg) format.
 3. Contractor shall execute a digital data licensing agreement in the form of AIA Document C106.
 4. The digital data files will be transmitted to the contractor via Newforma Info Exchange Server. By downloading these documents, the Contractor agrees to also accept the following terms and conditions:
 - a. Definitions: "S-H" shall mean Shive-Hattery, Inc., Shive-Hattery A/E Services, P.C., or Design Organization, a Division of Shive-Hattery, Inc. "Client" shall mean the person or entity that has executed an Agreement with S-H for services resulting in this electronic file. "Other Party" shall mean any person or entity other than S-H or Client.
 - b. Where these electronic files are provided under the terms and conditions of a contract and such contract terms and conditions conflict with these terms and conditions, then the

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contract terms and conditions shall prevail.

- c. In the event these electronic files are provided as a project deliverable to a Client of S-H:
 - 1) The electronic files are submitted to the Client for a 30-day Acceptance Period.
During this period, the Client may review and examine these files; any errors detected during this time will be corrected by S-H as part of the basic agreement. Any changes requested after the Acceptance Period will be considered additional services to be performed on a time and material basis at S-H's current standard fee schedule.
 - 2) Because data stored on electronic media can deteriorate undetected or can be modified without S-H's knowledge, the Client agrees that S-H will not be held liable for the completeness or correctness of the electronic media after an acceptance period of 30 days after delivery of the electronic files.
- d. Any use or reuse of original or altered electronic files by the Client or Other Party without written verification, or CAD adaptation for the specific purpose intended by S-H, will be at the Client's or Other Party's risk and full legal responsibility. Furthermore, the Client or Other Party will, to the fullest extent permitted by the law, indemnify and hold S-H harmless from any and all claims, suits, liability, demands, or costs arising out of or resulting therefrom. Any verification of such adaptation by the Client will entitle S-H to additional compensation at S-H's current standard fee schedule.
- e. S-H makes no warranty as to the compatibility of these files with other hardware or software.
- f. These electronic files were prepared by S-H and are instruments of S-H's service for use solely with respect to this project and S-H shall be deemed the author of these documents and shall retain all common law, statutory, and other reserved rights, including the copyright.

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) format 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, 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 PDF 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 PDF 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.
- C. Submittal Service: The selected service is:
 - 1. Newforma Project Cloud: www.newformaprojectcloud.com/#sle.

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- D. Training: A minimum of one (1) one-hour, web-based training session will be arranged for all participants, with representatives of Architect and Contractor participating; further training is the responsibility of the user of the service.
- E. Project Closeout: Architect will determine when to terminate the service for the project and is responsible for obtaining archive copies of files for Owner.

3.2 NEWFORMA INFO EXCHANGE SERVER

- A. Newforma Info Exchange server: The Architect will provide the Contractor access to this server to download and upload files via any internet-capable computer running Internet Explorer.
- B. Benefits and features of Newforma Info Exchange for the Contractor include:
 - 1. A collaborative submittal log is maintained within Newforma Info Exchange by the Architect and Contractor.
 - 2. Submittal data files transmitted through Newforma Info Exchange bypass the file size limits of email systems.
 - 3. Submittal data files transferred through Newforma Info Exchange are encrypted.
 - 4. Notifications and reminders can be optionally scheduled and expiration dates for documents can be automatically set.
 - 5. CD/DVD disc: The contractor is required to keep backup copies of any data submitted to the Architect in CD/DVD format. The Contractors transmittal letter identifying the project and contents of the disc must accompany the CD/DVD.
- C. Exceptions: The following submittals are not to be done electronically.
 - 1. Samples, color charts, original warranties, and notarized affidavits.

3.3 PRECONSTRUCTION MEETING

- A. Architect will schedule a meeting after Notice of Award.
- B. Attendance Required Authorized Representatives of:
 - 1. Owner.
 - 2. Architect and their subconsultants.
 - 3. Contractor and its superintendent; major subcontractors; suppliers, and other concerned parties.
- C. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
- D. Agenda: Discuss items of significance that could affect progress, including the following:
 - 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. Designation of personnel representing the parties to Contract, including Contractor, Owner, and <1|A/E|>, and their duties.
 - 6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
 - 7. Scheduling (tentative construction schedule and phasing).
- E. Architect will record minutes and distribute copies within five days after meeting to participants, with two copies to Architect, Owner, Contractor participants, and those affected by decisions made.

3.4 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the Work at maximum weekly intervals. Coordinate dates of meetings with preparation of payment requests.
- B. Make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.
- C. Attendance Required: Owner, Architect, Contractor Project Manager, Job Superintendent, and Major Subcontractors as appropriate to agenda topics for each meeting. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
- D. Agenda:
 - 1. Review minutes of previous meetings.

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2. Review of Work progress.
3. Field observations, problems, and decisions.
4. Identification of problems that impede, or will impede, planned progress.
5. Review of submittals schedule and status of submittals.
6. Maintenance of progress schedule.
7. Corrective measures to regain projected schedules.
8. Planned progress during succeeding work period.
9. Coordination of projected progress.
10. Maintenance of quality and work standards.
11. Effect of proposed changes on progress schedule and coordination.
12. Site utilization.
13. Work hours.
14. Progress cleaning.
15. Field observations.
16. RFIs.
17. Status of proposal requests.
18. Status of Change Orders.
19. Pending claims and disputes.
20. Documentation of information for payment requests.
21. Other business relating to Work.

- E. Record minutes and distribute copies within two days after meeting to participants, and those affected by decisions made.
- F. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

3.5 SUBMITTALS FOR REVIEW

- A. When the following are specified in individual sections, submit them for review:
 1. Product data.
 2. Shop drawings.
 3. Samples for selection.
 4. Samples for verification.
- B. Submit to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
- C. Samples will be reviewed only for aesthetic, color, or finish selection.
- D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 7800 - Closeout Submittals.

3.6 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.
 7. Other types indicated.
- B. Submit for Architect's knowledge as contract administrator or for Owner. No action will be taken.

3.7 SUBMITTALS FOR PROJECT CLOSEOUT

- A. When the following are specified in individual sections, submit them at project closeout:
 1. Project record documents.
 2. Operation and maintenance data.

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- 3. Warranties.
- 4. Bonds.
- 5. Other types as indicated.
- B. Submit for Owner's benefit during and after project completion.
- 3.8 NUMBER OF COPIES OF SUBMITTALS
 - A. Documents for Review:
 - 1. Small Size Sheets, Not Larger Than 8-1/2 x 11 inches (215 x 280 mm): Submit the number of copies that Contractor requires, plus two copies that will be retained by Architect.
 - 2. Larger Sheets, Not Larger Than 36 x 48 inches (910 x 1220 mm): Submit one reproducible transparency and one opaque reproduction.
 - B. Documents for Information: Submit two copies.
 - C. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
 - 1. After review, produce duplicates.
 - 2. Retained samples will not be returned to Contractor unless specifically so stated.
- 3.9 SUBMITTAL PROCEDURES
 - A. Submittal System: The contractor will provide electronic submittals using Newforma Info Exchange Server provided by the Architect.
 - B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.
 - 1. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received. This includes the right to withhold action on a submittal requiring color selection until all related color samples or submittals are received.
 - 2. The Contractor is responsible for assuring that each submittal is in full compliance with the submittal requirements prior to forwarding to the Architect for review. Submittals which are incomplete will be considered as not submitted until all submittal requirements are fulfilled. The architect has sole discretion to return incomplete submittals without review, to hold submittals until all requirements are fulfilled, to review partial submittals, or to waive partial requirements. In exercising this discretion, the Architect will incur no obligation to apply the same action to any other submittal.
 - 3. The Contractor is responsible for timely submission of submittals to allow for review and any subsequent corrections necessary prior to undertaking any work covered by the submittal.
 - C. Processing Time: Allow enough time for submittal review, including time for re-submittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including re-submittals.
 - 1. Initial Review: Allow 10 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals or consultants is required. Architect will advise Contractor when a submittal being processed requires extended review time for coordination.
 - 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 - 3. Resubmittal Review: Allow 10 days for review of each resubmittal.
 - 4. Should the Contractor request an expedited review in order to maintain schedule, the requests will be approved at the sole discretion of Architect. Rejection will not be cause for any claims for delay or additional cost by the Contractor. The Contractor shall be solely responsible should such rejection result in the completion of construction to occur after the contract deadlines.
 - D. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as

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final submittal.

- E. Re-submittals: Make re-submittals in same form and number of copies as initial submittal.
- F. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- G. Use for Construction: Use only final submittals with mark indicating "Furnish as Submitted" or "Furnish as Corrected" taken by Architect.
- H. Transmittal Form: Use Newforma Info Exchange Transmittal as approved by the Architect. When using the Architect's electronic submittal procedure, the transmittal form is part of the submittal file.
- I. Transmit each submittal with a copy of approved submittal form.
- J. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will reject and return received from sources other than Contractor.
 - 1. Transmittal Form Content: Provide locations on form for the following information:
 - a. Project name.
 - b. Date.
 - c. Destination (To:).
 - d. Source (From:).
 - e. Names of subcontractor, manufacturer, and supplier.
 - f. Category and type of submittal.
 - g. Submittal purpose and description.
 - h. Specification Section number and title.
 - i. Transmittal number (numbered consecutively).
 - j. Remarks.
 - k. Signature of transmitter.
- K. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same label information as related submittal.
- L. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.
- M. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy.
- N. 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. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
- O. Include the following information on label for processing and recording action taken:
 - 1. Project name.
 - 2. Date.
 - 3. Name and address of Architect.
 - 4. Name and address of Contractor.
 - 5. Name and address of subcontractor.
 - 6. Name and address of supplier.
 - 7. Submittal number or other unique identifier, including revision identifier.
 - a. Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 06-1000.01). Re-submittals shall include an alphabetic suffix after another decimal point (e.g., 06-1000.01.A).

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- P. Identify variations from Contract Documents and Product or system limitations that may be detrimental to successful performance of the completed Work.
- Q. When revised for resubmission, identify all changes made since previous submission.
- R. Distribute reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.
- S. Submittals not requested will not be recognized or processed.

3.10 ACTION SUBMITTALS

- A. General: Prepare and submit Action Submittals required by individual Specification Sections.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 - 1. Product Data includes printed information, such as manufacturer's installation instructions, catalog cuts, standard color charts, rough-in diagrams and templates, standard wiring diagrams, and performance curves. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
 - 2. Mark each copy of each submittal to show which products and options are applicable. Where printed Product Data includes information on several products that are not required, mark copies to indicate the applicable information.
 - 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
 - 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams showing factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 - 5. Submit Product Data before or concurrent with Samples.
 - 6. Number of Copies: Submit two copies of Product Data, unless otherwise indicated. Architect will return two copies. Mark up and retain one returned copy as a Project Record Document.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Shop Drawings based on reproductions of the Contract Documents does not relieve the Contractor from evaluating specific project needs and identifying specific materials, dimensions, etc. on the Shop Drawings. Do not copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not a Shop Drawing.
 - 1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Dimensions.
 - b. Identification of products.
 - c. Fabrication and installation drawings.
 - d. Roughing-in and setting diagrams.
 - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
 - f. Shop work manufacturing instructions.
 - g. Templates and patterns.
 - h. Schedules.
 - i. Design calculations.

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- j. Compliance with specified standards.
- k. Notation of coordination requirements.
- l. Notation of dimensions established by field measurement.
- m. Relationship to adjoining construction clearly indicated.
- n. Seal and signature of professional engineer if specified.
- o. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
- 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 40 inches.
- 3. Submit Shop Drawings in the following format:
 - a. PDF electronic file.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed. Refer to individual Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.
 - 1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 - 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Product name and name of manufacturer.
 - b. Sample source.
 - 3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
 - 4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - 5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit one full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
 - 6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned.
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- E. Proposed Product List: As required in individual Specification Sections, and as required per Division 01 Section 01 6000 "Product Requirements", prepare and submit the "Proposed Products List."

3.11 INFORMATIONAL SUBMITTALS

- A. General: Prepare and submit Informational Submittals required by other Specification Sections.

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1. Number of Copies: Submit two copies of each submittal, unless otherwise indicated. Architect will not return copies.
 2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 3. Test and Inspection Reports: Comply with requirements specified in Division 01 Quality Requirements.
 4. O&M and Closeout Requirements: Retain submission of closeout documentation (Manufacturer's Instructions, Warranties, etc.) until the end of the project, do not submit with individual specification section Product Data or Shop Drawing Submittals. Comply with the requirements specified in Division 01 Execution and Closeout Requirements.
 5. Informational Submittals listed in this Section are to be submitted separate from individual specification section Product Data or Shop Drawing submittals they are, by default, still considered "Informational Submittals", and as such the Architect Action Stamp does not apply to these portions unless specific comments are made otherwise.
- B. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- C. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- D. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- E. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- F. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- G. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- H. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- I. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
1. Name of evaluation organization.
 2. Date of evaluation.
 3. Time period when report is in effect.
 4. Product and manufacturers' names.
 5. Description of product.
 6. Test procedures and results.
 7. Limitations of use.
- J. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Division 01 "Closeout Submittals."
- K. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the

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following, as applicable:

1. Preparation of substrates.
 2. Required substrate tolerances.
 3. Sequence of installation or erection.
 4. Required installation tolerances.
 5. Required adjustments.
 6. Recommendations for cleaning and protection.
- L. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.
- M. Material Safety Data Sheets (SDS): Submit information directly to Owner; do not submit to Architect except as required in "Action Submittals" Article.
- N. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 "Closeout Submittals."

3.12 CONTRACTOR'S REVIEW

- A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Review each submittal for accuracy and completeness of dimensions and quantities, and for performance of equipment or systems. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect. Submittals deemed by the Architect to not have been reviewed by the Contractor prior to submission may be returned and considered as "Not Submitted".
- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents and coordinated with other Work of the contract.

3.13 ARCHITECT'S ACTION

- A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:
1. Furnish as Submitted: Denotes that the submittal meets the criteria of the drawings and specifications and no revisions are required. The Contractor may proceed with fabrication or procurement of the item reviewed and may proceed with the work shown on the drawings and specifications for this item.
 2. Furnish as Corrected: Denotes that there are deficiencies, but the Contractor may proceed with fabrication or procurement of the item reviewed and may proceed with the work shown on the drawings and specifications for the item if the deficiencies are first corrected.
 3. Revise and Resubmit: Denotes that the submittal does apply to the drawings and specifications, but insufficient detail has been shown or the submittal contains too many errors or omissions. The Contractor may NOT proceed with fabrication or procurement of the item reviewed and may NOT proceed with the work shown on the drawings and specifications for the item. The Contractor must revise the submittal and resubmit for review.
 4. Incomplete - Resubmit: Denotes that some portion of the submittal is incomplete and the Architect cannot, therefore, review the submittal. The Architect will describe the incompleteness by comment on the submittal. The Contractor may NOT proceed with fabrication or procurement of the item reviewed and may NOT proceed with the work shown on the drawings and specifications for the item. The Contractor must revise the submittal and resubmit for review.

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- 5. Rejected: Denotes that the submittal does not apply to the item specified or was not specified. The Contractor may NOT proceed with fabrication or procurement of the item reviewed and may NOT proceed with the work shown on the drawings and specifications for the item, and the Contractor must prepare a new submittal. The Architect will describe the reason for rejection by comment on the submittal.
- C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- D. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.
- E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.
- F. Architects review is only for limited purpose of checking for general conformance with the information given and design concept expressed in the Contract Documents.
- G. Unless notified otherwise by the Contractor, the Architect's notations, comments, and mark-ups on approved submittals shall have the same effect as the Architect's order for minor changes in the Work not involving adjustment in the contract sum or extension in the contract time. The Contractor will proceed with the work, and the response will be incorporated into the contract the same as the Architect's written order for minor changes in the Work. Notify Architect in writing if noted modifications cannot be made due to conflicting circumstances in the field, in other contract documents, or for other reasons.
- H. If the Contractor believes that the Architect's notations, comments, or mark-ups constitute a change that results in added cost or time, the Contractor is to notify the Architect in writing within seven (7) days of receipt of the reviewed submittal. Do not proceed with changes that result in added cost or time until the matter is resolved in accordance with other provisions of the contract.

END OF SECTION

**SECTION 01 4000
QUALITY REQUIREMENTS**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Quality assurance.
- B. References and standards.
- C. Testing and inspection agencies and services.
- D. Contractor's construction-related professional design services.
- E. Control of installation.
- F. Tolerances.
- G. Manufacturers' field services.
- H. Defect Assessment.

1.2 DEFINITIONS

- A. Contractor's Quality Control Plan: Contractor's management plan for executing the Contract for Construction.
- B. 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. Construction-Related: Services Contractor needs to provide in order to carry out the Contractor's sole responsibilities for construction means, methods, techniques, sequences, and procedures.
 - b. 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.

1.3 CONTRACTOR'S CONSTRUCTION-RELATED PROFESSIONAL DESIGN SERVICES

- A. Coordination: Contractor's professional design services are subject to requirements of project's Conditions for Construction Contract.
- B. Provide such engineering design services as may be necessary to plan and safely conduct certain construction operations, pertaining to, but not limited to the following:
 - 1. Temporary scaffolding.
 - 2. Temporary bracing.
 - 3. Temporary falsework for support of spanning or arched structures.
 - 4. Temporary hoist(s) and rigging.

1.4 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.
- C. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.
- D. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.
- E. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

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- F. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- G. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
- H. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.5 QUALITY ASSURANCE

- A. Designer Qualifications: Where professional engineering design services and design data submittals are specifically required of Contractor by Contract Documents, provide services of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.
- B. Contractor's Quality Control (CQC) Plan:
 - 1. Prior to start of work, submit a comprehensive plan describing how contract deliverables will be produced. Tailor CQC plan to specific requirements of the project. Include the following information:
 - a. Management Structure: Identify personnel responsible for quality. Include a chart showing lines of authority.
 - b. Management Approach: Define, describe, and include in the plan specific methodologies used in executing the work.
 - 1) Management and control of documents and records relating to quality.
 - 2) Communications.
 - 3) Coordination procedures.
 - 4) Resource management.
 - 5) Tracking deficiencies from identification, through acceptable corrective action, and verification.

1.6 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.
- F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 - 1. Requirement for specialists shall not supersede building codes and regulations governing the Work.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities

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having jurisdiction, that is acceptable to authorities.

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

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

1.7 REFERENCES AND STANDARDS

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

1.8 CONFLICTING REQUIREMENTS

- A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.9 TESTING AND INSPECTION AGENCIES AND SERVICES

- A. Payment for these services will be made from testing and inspecting allowances, as authorized by Change Orders.
- B. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor and the Contract Sum will be adjusted by Change Order.
- C. Acceptable Testing Agencies
 1. Shive-Hattery, Inc.

PART 2 PRODUCTS

2.1 REQUIREMENTS

- A. Comply with the requirements specified in Division 01 Product Requirements.

PART 3 EXECUTION

3.1 TEST AND INSPECTION LOG

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

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

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
 - 2. Comply with the Contract Document requirements for Division 01 Section "Cutting and Patching."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

3.3 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.

3.4 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.

3.5 TESTING AND INSPECTION

- A. Testing Agency Duties:
 - 1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
 - 2. Perform specified sampling and testing of products in accordance with specified standards.
 - 3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
 - 4. Promptly notify Architect and Contractor of observed irregularities or non-compliance of Work or products.
 - 5. Perform additional tests and inspections required by Architect.
 - 6. Submit reports of all tests/inspections specified.
- B. Limits on Testing/Inspection Agency Authority:
 - 1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
 - 2. Agency may not approve or accept any portion of the Work.
 - 3. Agency may not assume any duties of Contractor.
 - 4. Agency has no authority to stop the Work.
- C. Contractor Responsibilities:
 - 1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.

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2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
 3. Provide incidental labor and facilities:
 - a. To provide access to Work to be tested/inspected.
 - b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
 - c. To facilitate tests/inspections.
 - d. To provide storage and curing of test samples.
 4. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
 5. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
 6. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
- D. Re-testing required because of non-compliance with specified requirements shall be performed by the same agency on instructions by Architect.
- E. Re-testing required because of non-conformance to specified requirements shall be paid for by Contractor. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
- F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- G. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within 30 days of date established for commencement of the Work.
1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

3.6 MANUFACTURERS' FIELD SERVICES

- A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance equipment as applicable, and to initiate instructions when necessary.
- B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.7 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

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**SECTION 01 5000
TEMPORARY FACILITIES AND CONTROLS**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Temporary utilities.
- B. Temporary sanitary facilities.
- C. Temporary Controls: Barriers, enclosures, and fencing.
- D. Security requirements.
- E. Vehicular access and parking.
- F. Waste removal facilities and services.

1.2 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.
- B. Use trigger-operated nozzles for water hoses, to avoid waste of water.

1.3 TEMPORARY SANITARY FACILITIES

- A. Owner's designated facilities may be utilized.
- B. Maintain daily in clean and sanitary condition.
- C. At end of construction, return facilities to same or better condition as originally found.

1.4 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public, to allow for owner's use of site and to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.5 SECURITY

- A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.
- B. Coordinate with Owner's security program.

1.6 VEHICULAR ACCESS AND PARKING

- A. Comply with regulations relating to use of streets and sidewalks, access to emergency facilities, and access for emergency vehicles.
- B. Coordinate access and haul routes with governing authorities and Owner.
- C. Provide and maintain access to fire hydrants, free of obstructions.
- D. Existing parking areas may be used for construction parking.

1.7 WASTE REMOVAL

- A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.
- B. Provide containers with lids. Remove trash from site periodically.
- C. If materials to be recycled or re-used on the project 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.
- D. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.8 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.
- B. Clean and repair damage caused by installation or use of temporary work.
- C. Restore existing facilities used during construction to original condition.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

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**SECTION 01 6000
PRODUCT REQUIREMENTS**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Administrative and procedural requirements for selection of products for use in Project
- B. Product delivery
- C. Manufacturers' standard special warranties on products
- D. Comparable products
- E. Transportation, handling, storage and protection.
- F. Product option requirements.
- G. Substitution limitations and procedures.
- H. Maintenance materials, including extra materials, spare parts, tools, and software.

1.2 DEFINITIONS

- A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
- C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

1.3 SUBMITTALS

- A. Proposed Products List: Submit list, in tabular form, of major products proposed for use, with name of manufacturer, trade name, and model number of each product.
 - 1. Initial List: Submit within 30 days after date of Agreement. Include a written explanation for omissions of data and for variations from Contract requirements.
 - a. At Contractor's option, initial list may be limited to product selections and designations that must be established early in Contract period.
 - 2. For products specified only by reference standards, list applicable reference standards.
 - 3. Completed List: Submit within 60 days after date of Agreement.
 - 4. Include a written explanation for omissions of data and for variations from Contract requirements.
 - 5. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
 - 6. Form: Tabulate information for each product under the following column headings:
 - a. Specification Section number and title.
 - b. Generic name used in the Contract Documents.
 - c. Proprietary name, model number, and similar designations.
 - d. Manufacturer's name and address.
 - e. Supplier's name and address.

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- f. Installer's name and address.
 - g. Projected delivery date or time span of delivery period.
 - h. Identification of items that require early submittal approval for scheduled delivery date.
 - 7. Architect's Action: Architect will respond in writing to Contractor within 15 days of receipt of completed product list. Architect's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Architect's response, or lack of response, does not constitute a waiver of requirement to comply with the Contract Documents.
 - B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
 - C. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
 - D. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
 - 1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.
 - E. Comparable Product Requests: Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Conditions: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 - b. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 - c. Evidence that proposed product provides specified warranty.
 - d. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
 - e. Samples, if requested.
 - 2. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or 15 days of receipt of additional information or documentation, whichever is later.
 - a. Form of Approval: Comply with requirements specified in Division 01 "Administrative Requirements."
 - F. Basis-of-Design Product Specification Submittal: Comply with requirements specified in Division 01 "Administrative Requirements." Show compliance with requirements.
- 1.4 COMPATIBILITY OF OPTIONS
- A. Comply with requirements in Division 01 Quality Requirements.
 - B. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.
 - 1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
 - 2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

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1.5 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 - 1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 - 2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
 - 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 - a. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.
 - b. Refer to Divisions 02 through 48 for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Division 01 "Execution and Closeout Requirements" and "Closeout Submittals."

PART 2 PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.
 - 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 - a. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 - 1) Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 - 2) Where products are accompanied by the term "as selected," Architect will make selection.
 - 3) Where products are accompanied by the term "match sample," sample to be matched is Architect's.
 - 4) Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
 - 5) Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in Part 2 "Comparable Product Requests" Article to obtain approval for use of an unnamed product
- B. Product Selection Procedures.
 - 1. Product: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements.
 - 2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.
 - 3. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
 - 4. Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements.

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5. Available Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with provisions in Part 2 "Comparable Product Requests" Article for consideration of an unnamed product.
6. Available Manufacturers: Where Specifications include a list of manufacturers, provide a product by one of the manufacturers listed, or an unnamed manufacturer, that complies with requirements. Comply with provisions in Part 2 "Comparable Product Requests" Article for consideration of an unnamed product.
7. Product Options: Where Specifications indicate that sizes, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide the specified product or system. Comply with provisions in Part 2 "Product Substitutions" Article for consideration of an unnamed product or system.
8. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in Part 2 "Comparable Product Requests" Article for consideration of an unnamed product by the other named manufacturers.
9. Visual Matching Specification: Where Specifications require matching an established Sample, select a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
 - a. If no product available within specified category matches and complies with other specified requirements, comply with provisions in Part 2 "Product Substitutions" Article for proposal of product.
10. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.

2.2 NEW PRODUCTS

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

2.3 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
- B. 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.
- C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

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 SUBSTITUTION PROCEDURES

- A. Instructions to Bidders specifies time restrictions for submitting requests for substitutions during the bidding period. Comply with requirements specified in this section.
- B. Architect will consider requests for substitutions only within 5 days after date of Agreement. Requests received after that time may be considered or rejected at discretion of Architect.
- C. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.
- D. A request for substitution constitutes a representation that the submitter:
 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.

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2. Agrees to provide the same warranty for the substitution as for the specified product.
 3. Agrees to coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
 4. Waives claims for additional costs or time extension that may subsequently become apparent.
 5. Agrees to reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.
- E. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.
- F. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
1. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume.
Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
 - a. Requested substitution does not require extensive revisions to the Contract Documents.
 - b. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - c. Substitution request is fully documented and properly submitted.
 - d. Requested substitution will not adversely affect Contractor's Construction Schedule.
 - e. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - f. Requested substitution is compatible with other portions of the Work.
 - g. Requested substitution has been coordinated with other portions of the Work.
 - h. Requested substitution provides specified warranty.
 - i. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- G. Substitution Request Submittal Procedure:
1. Limit each request to one proposed substitution. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles
 2. Substitution Request Form: Use facsimile of form provided at end of Section. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
 3. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified material or product cannot be provided.
 - b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
 - 1) Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 - c. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - d. Samples, where applicable or requested.
 - e. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.

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- f. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - g. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
 - h. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.
 - i. Cost information, including a proposal of change, if any, in the Contract Sum.
 - j. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
 - k. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results
4. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within 7 days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.
- a. Form of Acceptance: Change Order.
 - b. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.

3.2 TRANSPORTATION AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft.
- B. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
- C. Deliver products to project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
- D. Coordinate schedule of product delivery to designated prepared areas at project site in order to minimize long-term site storage time, overcrowding of construction spaces, and potential damage to stored materials.
- E. Transport and handle products in accordance with manufacturer's instructions.
- F. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
- G. Promptly inspect shipments on delivery to ensure that products comply with requirements of the Contract Documents, quantities are correct, and products are properly protected and undamaged.
- H. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.
- I. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.3 STORAGE AND PROTECTION

- A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.
- B. Store and protect products in accordance with manufacturers' instructions.
- C. Store with seals and labels intact and legible.
- D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.
- E. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.

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- F. Cover products subject to deterioration by the elements, above ground, with impervious sheet covering. Provide adequate 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 and measurement of quantity or counting of units. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.
- J. Store materials in a manner that will not endanger Project structure.
- K. Store cementitious products and materials on elevated platforms.
- L. Store items subject to sun damage such as foam and, plastics away from exposure to sunlight, except to extent necessary for period of installation and concealment.
- M. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage
- N. Protect stored products and liquids from damage from freezing
- O. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

END OF SECTION

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**SECTION 01 7000
EXECUTION AND CLOSEOUT REQUIREMENTS**

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. Cutting and patching.
- D. Surveying for laying out the work.
- E. Cleaning and protection.
- F. Starting of systems and equipment.
- G. Demonstration and instruction of Owner personnel.
- H. Substantial Completion.
- I. Final Completion.
- J. Closeout procedures, except payment procedures.

1.2 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
 - 1. Structural integrity of any element of Project.
 - 2. Integrity of weather exposed or moisture resistant element.
 - 3. Efficiency, maintenance, or safety of any operational element.
 - 4. Visual qualities of sight exposed elements.
 - 5. Work of Owner or separate Contractor.
- C. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.3 QUALITY ASSURANCE

- A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
- B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operating elements include the following:
 - 1. Mechanical systems piping and ducts.
 - 2. Electrical wiring systems.
- C. Life Safety Elements: Do not cut and patch life safety elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Life Safety Elements include the following:
 - 1. Fire Alarm Devices, circuits or power serving such devices.
 - 2. Fire Suppression systems.
 - 3. Fire Rated walls.
 - 4. Fire Rated doors and associated hardware.
 - 5. Security cameras, video, CCTV, remote locking devices and other security systems.
 - 6. Emergency Lighting and power circuits serving other areas remaining occupied.

1.4 PROJECT CONDITIONS

- A. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- B. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere and over adjacent property.
 - 1. Provide dust-proof barriers between construction areas and areas continuing to be occupied by Owner.

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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 shown 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.

1.6 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
 - 1. Prepare and submit a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete. Additionally, attach a copy of work required for each room to the door entering the room. Subcontractor and Superintendent to initial as each Work item is completed. Attach supplemental lists as required.
 - 2. Advise Owner of pending insurance changeover requirements.
 - 3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases by applicable authorities having jurisdiction.
 - 5. Complete final cleaning requirements, including touchup painting, floor waxing, buffing, sealing, etc.
 - 6. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- B. Inspection Procedures: Submit a written request for inspection for Substantial Completion a minimum of seven (7) days in advance of the requested Substantial Completion inspection date. On receipt of request, Architect may notify Contractor of unfulfilled requirements. On date of inspection, Architect will conduct a review and either proceed with inspection or notify Contractor that the project is not Substantially Complete due to unfulfilled requirements.
 - 1. Upon inspection the Architect and the Owner's representative will accompany the Contractor on a walk-through review of the Contractor's punch list. Should the Architect and/or the Owner's representative observe work which is incomplete or defective which is not included on the contractor's punch list, the Architect will prepare a supplemental punch list of items to be completed or corrected.
 - 2. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
 - 3. Results of the completed inspection will form the basis of requirements for establishing Final Completion.

1.7 FINAL COMPLETION

- A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

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1. Submit a final Application for Payment according to Division 01 Section "Price and Payment Procedures".
 2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Contractor. The certified copy of the list shall state that the Work, including each item on the list has been completed or otherwise resolved for acceptance. Provide explanations for each proposed resolution to incomplete items.
 3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
 4. Submit pest-control final inspection report and warranty.
 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training videos. Obtain signed attendance sheets and submit them to the Architect.
- B. Inspection Procedures: Submit a written request for inspection for Final Completion, a minimum of (7) days in advance of the requested Final Completion Inspection Date. On receipt of request, Architect [and Construction Manager] may notify Contractor of unfulfilled requirements. On date of inspection, Architect [and Construction Manager] will conduct a review and either proceed with inspection or notify Contractor that the project is not Finally Complete due to unfulfilled requirements.
1. Upon Inspection the Architect and the Owner's representative will accompany the Contractor's superintendent on a walk-through review of the Substantial Completion punch list.
 2. Architect will process the final Application for Payment after inspection providing all closeout documentation has been received and is acceptable, or the Architect will notify Contractor of construction and/or documentation that must be completed or corrected before final Application for Payment will be processed.

1.8 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
1. Organize list of spaces in sequential order starting with exterior areas first and proceeding from lowest floor to highest floor.
 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 3. Indicate the subcontractor responsible for each item; provide spaces for subcontractor and superintendent to initial each item as Work is completed.
 4. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Page number.

1.9 WARRANTIES

- A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
- B. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.

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- 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 - 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 PRODUCTS

2.1 PATCHING MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. New Materials: As specified in product sections; match existing products and work for patching and extending work.
- C. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
- D. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 6000 - Product Requirements.

2.2 CLEANING PRODUCTS

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

PART 3 EXECUTION

3.1 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. Temporary Support: Provide temporary support of Work to be cut.
- C. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- D. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- E. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

3.3 LAYING OUT THE WORK

- A. Promptly notify Architect of any discrepancies discovered.

3.4 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.

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

3.5 ALTERATIONS

- A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
 - 1. Verify that construction and utility arrangements are as shown.
 - 2. Report discrepancies to Architect before disturbing existing installation.
 - 3. Beginning of alterations work constitutes acceptance of existing conditions.
- B. Remove existing work as indicated and as required to accomplish new work.
 - 1. Remove items indicated on drawings.
 - 2. Relocate items indicated on drawings.
- C. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
 - 1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components; if necessary, modify installation to allow access or provide access panel.
 - 2. Where existing systems or equipment are not active and Contract Documents require reactivation, put back into operational condition; repair supply, distribution, and equipment as required.
 - 3. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
 - a. Disable existing systems only to make switchovers and connections; minimize duration of outages.
 - b. Provide temporary connections as required to maintain existing systems in service.
 - 4. Verify that abandoned services serve only abandoned facilities.
 - 5. Remove abandoned pipe, ducts, conduits, and equipment , including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.
- D. Protect existing work to remain.
 - 1. Prevent movement of structure; provide shoring and bracing if necessary.
 - 2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
 - 3. Repair adjacent construction and finishes damaged during removal work.
- E. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
- F. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.
- G. Refinish existing surfaces as indicated:
 - 1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
 - 2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.
- H. Clean existing systems and equipment.
- I. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.
- J. Do not begin new construction in alterations areas before demolition is complete.
- K. Comply with all other applicable requirements of this section.

3.6 CUTTING AND PATCHING

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

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- B. See Alterations article above for additional requirements.
- C. Perform whatever cutting and patching is necessary to:
 - 1. Complete the work.
 - 2. Fit products together to integrate with other work.
 - 3. Provide openings for penetration of mechanical, electrical, and other services.
 - 4. Match work that has been cut to adjacent work.
 - 5. Repair areas adjacent to cuts to required condition.
 - 6. Repair new work damaged by subsequent work.
 - 7. Remove samples of installed work for testing when requested.
 - 8. Remove and replace defective and non-conforming work.
- D. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
- E. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- F. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- G. Restore work with new products in accordance with requirements of Contract Documents.
- H. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- I. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material, to full thickness of the penetrated element.
- J. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.
 - 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.

3.7 PROGRESS CLEANING

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
- C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
- D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.8 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. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.9 SYSTEM STARTUP

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

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- C. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- D. Verify that wiring and support components for equipment are complete and tested.
- E. Execute start-up under supervision of applicable Contractor personnel in accordance with manufacturers' instructions.
- F. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.10 DEMONSTRATION AND INSTRUCTION

- A. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.
- B. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
- C. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of owner personnel.

3.11 ADJUSTING

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

3.12 FINAL CLEANING

- A. Execute final cleaning prior to final project assessment.
- B. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- C. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 - 1. Use cleaning materials that are nonhazardous.
 - 2. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
 - 3. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
 - 4. Clean site; sweep paved areas, rake clean landscaped surfaces.
 - 5. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.13 CLOSEOUT PROCEDURES

- A. Make submittals that are required by governing or other authorities.
 - 1. Provide copies to Architect.
- B. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.
- C. Submit written certification 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 review.
- D. Owner will occupy all of the building as specified in Section 01 1000.
- E. Correct items of work listed in executed Certificates of Substantial Completion and comply with requirements for access to Owner-occupied areas.
- F. Notify Architect when work is considered finally complete.
- G. Complete items of work determined by Architect's final inspection.

END OF SECTION

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**SECTION 01 7800
CLOSEOUT SUBMITTALS**

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 7200 - General Conditions: Performance bond and labor and material payment bonds, warranty, and correction of work.
- B. Section 01 3000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
- C. Section 01 7000 - 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. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
 - 2. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
 - 3. Submit one copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
 - 4. Submit two sets of revised final documents in final form within 10 days after final inspection.
- 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.
 - 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.
- E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
 - 1. Manufacturer's name and product model and number.

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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 depths of foundations in relation to finish first floor datum.

2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.

4. Field changes of dimension and detail.

5. Details not on 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 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

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

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

C. Binders: Commercial quality, 8-1/2 by 11 inch (216 by 280 mm) three D side ring binders with durable plastic covers; 2 inch (50 mm) maximum ring size. When multiple binders are used, correlate data into related consistent groupings.

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

E. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect/Contractor, with names of responsible parties.

F. 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.

G. 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.

H. Text: Manufacturer's printed data, or typewritten data on 20 pound paper.

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

J. 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.

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3.4 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.

END OF SECTION

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**SECTION 11 6000
RIGGING SYSTEM**

PART 1 - GENERAL

1.1 SCOPE

- A. This specification requires the complete fabrication, delivery, and installation of the stage rigging system, tracks, and all incidental items required for the completion of the work. The contract drawings and this specification are meant to be complimentary to one another and what is required by one shall be as if required by both.
- B. Contractor shall follow all procedures and provide all documents as delineated in the General Requirements section of this document.
- C. All equipment shall be installed as per manufacturer's shop drawings, as approved by the Engineer.
- D. Work Included:
 - 1. Demolition and recycling of existing rigging system.
 - 2. Fabrication of new rigging equipment as required for stationary rigging of theatre lighting as shown on contract drawings.
 - 3. Installation of all rigging equipment. Furnish all material, tools, and labor required for components provided.
 - 4. Upon completion of installation, provide Owner training of instruction in the operation and maintenance procedures.
 - 5. The Rigging Contractor shall coordinate with the Electrical Contractor for the rigging of electric battens, lighting, and raceways.
- E. Field Conditions:
 - 1. All bidders shall check site conditions and inform themselves of all conditions under which the work is to be performed.
 - 2. Additional compensation will not be awarded for either labor or materials required for items where the bidder could have been informed prior to bidding.

1.2 GENERAL REQUIREMENTS

- A. Insurance: The rigging contractor shall maintain injury, property, and liability insurance throughout the construction and installation period. Moline- Coal Valley Community School District will not be held liable for property damage or personal injury due to the negligence of the contractor.
- B. Safety: Installation and testing shall conform to all applicable code requirements and be in compliance with industry standard practice.
- C. Drawings: Submit shop and installation drawings with all information necessary to clearly indicate the design, fabrication, and installation procedures of all components and systems in the project. Shop drawings shall be approved by Engineer before the fabrication and installation can begin.
- D. Schedule: Prior to installation, submit a proposed installation schedule for approval.

1.3 WARRANTY

- A. All parts and labor for a period of one year after final acceptance.
- B. Defective parts shall be replaced within sixty (60) days.

1.4 BIDDING REQUIREMENTS

- A. Contracts shall bid the complete project with all elements included. **Approved Manufacturers:** This specification is based on the quality of equipment manufactured by Chicago Flyhouse.
- B. Approved Rigging Contractors:
 - 1. Chicago Flyhouse
2450 W. Hubbard Street
Chicago, IL 60642
773-533-1590

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2. Grand Stage Company
1318 W Grand Ave
Chicago, IL 60642
312.332.5611
3. Tiffin Scenic Studios, Inc.
146 Riverside Drive
Tiffin, OH 44883
Contact: Mr. Ryan Brookes
800.445.1546
4. Gopher Stage Lighting
4141 Cedar Ave S
Minneapolis, MN 55407
Attention: Michael James
612.871.0138

1.5 SUBMITTALS

A. Shop drawings and technical data:

1. Complete shop drawings from the manufacturer which detail materials selection and fabrication methods for all system components.
2. Contractor shall provide complete installation drawings which detail equipment positioning and attachment methods.
3. Catalog cuts for all hardware and components incorporated into the project.
4. All information on applied loads to existing structure and associated information necessary for review of applied loads to existing structure.

B. Comply with all requirements and procedures required in General Requirements section with regard to:

1. Maintenance manuals.
2. Record documents.
3. Final corrected drawings.

PART 2 - PRODUCTS

2.1 GENERAL SPECIFICATIONS

A. All equipment shall be fabricated according to the following industrial standards as specified within this document:

1. USA, American Iron and Steel Institute (AISI), "Wire Rope Users Manual"
2. USA, American Gear Manufacturer's Association (AGMA)
3. USA, National Electrical Manufacturer's Association (NEMA)
4. USA, American Society of Testing of Materials (ASTM)
5. USA, Society of Automotive Engineers (SAE)
6. USA, American Welding Society (AWS)

B. Materials. For all new equipment supplied, all materials shall be new and unused.

1. Battens shall be fabricated from 1 ½" schedule 40 steel pipe.
2. Steel used in the manufacture of all items specified will be constructed with ASTM A36 structural grade steel unless otherwise noted.
3. Sheaves shall be cast semi-steel and comply with ASTM specification A48-62, Class 30A. Each casting shall have a tensile strength of 30,000 psi with a maximum transverse strength of 1,000 pounds.

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4. Hardware Requirements. Catalog cuts with the following information must be provided for all the hardware used within the project, including bearings, bolts, anchor bolts, and rigging hardware turnbuckles, thimbles, shackles, swages, & wedge sockets:

Manufacturer, Model number
Design criteria, application
Load rating and safety factor

C. Fabrication:

1. All welding shall be done by certified welders (AWS) with current certificates.
2. All mechanical components shall be installed within manufacturer's tolerances and specifications. This shall include but not be limited to shafts, bearings, bushings, couplings, motors, reducers, and rigging hardware.
3. Incorporate best workmanship for good fit and finish. Do not leave sharp corners, edges or burrs exposed. Assembly of all components shall be by means of tight fitting, locked connections which present a smooth finished surface to prevent fouling running lines, scenery, and other moving parts.
4. Equipment shall be built and installed to facilitate maintenance or replacement of defective parts.

D. Finishes:

1. Steel components:
 - a. Shall be ground smooth and made clean of rust, scale or other surface corrosion.
 - b. All steel including auxiliary steel structure and welds must be (red) lead oxide primed before painting finish color.
2. All bolts, hardware, and rigging hardware shall be plated or painted.
3. All components shall be black in finish.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

- A. Alignment. All sets shall be properly aligned to ensure low friction and long wearing operation.
1. Each head block shall be located directly over its arbor. Each tension block shall be located directly under its head block and arbor.
 2. All battens shall be parallel to the plaster line within 1/2" & parallel to the stage floor within 1/2". Each batten's centerline shall be located directly over the stage centerline.
- B. Attachments. All equipment shall be attached with bolts, washers, and lock washers or lock nuts. Welding to the building steel structure is not permissible.
1. All attachments shall be designed within the general 8:1 factor of safety requirement.
 2. All bolts shall be of structural grade and shall be tightened to the manufacturer's torque requirement.

3.2 CLOSE OUT, TESTING AND FINAL ACCEPTANCE

- A. The contractor shall ensure that all equipment is safely and securely installed as per equipment specification.
- B. The contractor shall remove all tools and construction debris from the job site with in seven (7) days of final acceptance of the work.
- C. The operation of each type of equipment shall be demonstrated to the owner under design load conditions. Selection of the specific equipment to be tested shall be made by the owner.
- D. The contractor shall supply the operation and maintenance manuals for final discussion and approval.

END OF SECTION

**SECTION 11 6100
STAGE AND ARCHITECTURAL LIGHTING SYSTEM**

PART 1 - GENERAL

1.1 SCOPE

- A. This specification requires the complete fabrication, delivery, and installation of the upgrade to the stage lighting system including fixtures, power and control wiring, architectural controls, and all incidental items required for the completion of the work. The contract drawings and this specification are meant to be complimentary to one another and what is required by one shall be as if required by both.
- B. Contractor shall follow all procedures and provide all documents as delineated in the General Requirements section of this document. The Electrical Contractor is responsible for the physical installation of the complete systems specified, including all conduit, wire, boxes, racks, raceways, switches, relay panels, multi-cables, fixtures, accessories, and necessary hardware. All equipment shall be installed as per manufacturer's shop drawings, as approved by the Engineer.
- C. This equipment specification is based on the products of Electronic Theatre Controls (ETC) of Middleton, Wisconsin and Altman Lighting Co. of Yonkers, New York. To guarantee the product warranties, the Electrical Contractor shall purchase all theatrical equipment systems from a theatrical contractor who is a certified manufacturer's representative.

1. Approved vendors shall include:

Gopher Stage Lighting
4141 Cedar Avenue
Minneapolis, MN 55407
(612)-871-0138
Attention: Dave Johnson, Jim Barrett
www.gopherstagelighting.com

Barbizon Chicago
2525 N. Elston Avenue
Suite D220
Chicago, IL 60647
(800) 935-3920 x5226
Attention: Carl Spaulding
www.barbizon.com/chicago

Heartland Scenic Studio
5359 Lindberg Dr.
Omaha, Nebraska 68110
Attention: Jerry Onik
www.heartlandscenic.com

2. Acceptable alternate vendors shall include:

- A: Conference Technologies
- B: Grand Stage

D. Work Included:

- 1. Fabrication of new lighting equipment as laid out in this document and the project drawings. Installation of all wiring and switching indicated on project drawings.
- 2. Delivery of all equipment and materials to the work site. Electrical Contractor shall receive and store all equipment in a dry and secure place prior to installation.
- 3. Installation of all lighting equipment specified. Furnish all material, tools, labor, and expertise required for both mechanical and electrical components provided. PAT Design will provide a revised final light plot based on equipment package agreed to in the tendering process.
- 4. Upon completion of installation, provide a one (1) day period of instruction in the operation and maintenance procedures for the Owner's representative.
- 5. Six months after the final acceptance of the installation, contractor shall make electrical and mechanical adjustments as required and directed by the Engineer or Owner.

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E. Field Conditions:

1. All bidders shall check site conditions and inform themselves of all conditions under which the work is to be performed.
2. Additional compensation will not be awarded for either labor or materials required for items where the bidder could have been informed prior to bidding.

1.2 WARRANTY

- A. All parts and labor shall be guaranteed for a period of one year after final acceptance.
- B. Any defective parts discovered during this time period shall be replaced within thirty (30) days.

1.3 BIDDING REQUIREMENTS

- A. Contractor shall bid the complete project with all elements included. Contractor shall provide a per unit price deduction for the following line items:

1. Type T1 Light Fixture Indicated on Plans	1
2. Type T2 Light Fixture Indicated on Plans	1
3. Type T3 Light Fixture Indicated on Plans	1
4. Type T4 Light Fixture Indicated on Plans	1

1.4 CONTRACTOR SUBMITTALS

- A. Shop drawings and technical data required:
1. Provide complete shop drawings from the manufacturer which detail materials selection and fabrication methods for all system components.
 2. Provide complete installation drawings which detail equipment positioning and attachment methods.
 3. Provide catalog cuts for all hardware and electrical components incorporated into the project.
 4. Contractor shall bind all shop drawings and catalog cuts into folders with a title sheet for identification for the project, project architect, and lighting contractor. Allow space for contractor, architect, and engineer review stamps. All submittals must bear the handwritten signature of the contractor and his stamp of approval before being considered.
- B. Comply with all requirements and procedures required in General Requirements section with regard to:
1. Maintenance manuals.
 2. Record documents.
 3. Final corrected drawings.

PART 2 – PRODUCTS

2.1 GENERAL SPECIFICATIONS

- A. All equipment shall be fabricated according to the following industrial standards as specified within this document:
- USA, National Electrical Manufacturer's Association (NEMA)
 - USA, American Welding Society (AWS)
 - USA, Underwriter's Laboratories (UL)
- B. Materials. For all equipment supplied, all materials shall be new and unused.
1. Steel components used in the manufacture of items specified will be constructed with ASTM A36 structural grade steel unless otherwise noted.

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2. Component requirements. Catalog cuts with the following information must be provided for all the electrical components used within the project including boxes, raceways, conduits, conductors, and connectors:

- a. Manufacturer
- b. Model number
- c. Design criteria
- d. Application

C. Fabrication:

1. All electrical components shall be installed within Manufacturer's tolerances and specifications.
2. Equipment shall be built and installed to facilitate maintenance and replacement of defective parts.

D. Finishes:

1. Steel components:
 - a. Shall be ground smooth and made clean of rust, scale or other surface corrosion. All auxiliary steel structure and welds must be (red) lead oxide primed before painting finish color. Match exposed adjacent steel structure.
 - b. All cabinets shall be primed and painted with enamel. Scratches and abrasions shall be touched up on site after installation. Finish color shall be manufacturer's stock color.
2. All bolts, hardware, and rigging hardware shall be plated or painted.

2.2 POWER DISTRIBUTION AND CONTROL WIRING.

A. Relay 120 Volt Output

1. Electrical Contractor to provide circuit panelboard to feed relay panel, as specified on drawings.
2. The output circuits from the relay panel shall terminate into boxes and raceways as shown on the contract drawings. All enclosures shall be NEMA or UL approved
3. All output circuits shall terminate in Edison connectors. All terminations shall be clearly labeled with their circuit number in white block lettering two inches in height. The box or raceway connection for all SO cable shall incorporate Kellems grip strain relief.
4. All EMT wiring runs shall be #10 THHN. The HOT and NEUTRAL for each output circuit must run as a pair from the dimmer rack to the output connector. Neutrals may not be bussed. Pull one (1) individual ground conductor from the rack to each individual raceway or termination box.

B. POWER DISTRIBUTION – CONNECTOR STRIPS

1. The connector strips shall be the ColorSource Raceway by ETC, Inc., or approved equal
2. General
 - a. Connector strips shall provide distributed power form incoming circuits to plugs along a raceway.
 - b. Internal wiring shall be sized to circuit ampacity and shall be rated at 125°C
 - c. Connector strips shall support a combination of line voltage power and low voltage data distribution within a single raceway.
 - d. Connector strips shall be listed by a nationally recognized test lab (NRTL). Connector strips that are not listed shall not be acceptable.

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- e. Furnish with quantity of lighting connectors corresponding with associated quantity of input circuits indicated on plans. Provide at manufacturer recommended spacing to accommodate typical arrangement of lighting.
 - f. Furnish with appropriate hanger bracket types that are compatible with new rigging pipes.
 - g. Furnish with terminal box(es) positioned at end nearest the associated electrical panelboard location.
3. Physical
- a. Connector strips shall be 127mm H x 45mm D and fabricated from 1.6mm aluminum finished in black fine-texture powder coat paint.
 - b. Connector strips shall be furnished of maximum length available to form the indicated layout on plans and shall ship fully wired with all splicing hardware.
 - c. Connector strips shall weigh no more than 2.5lbs/ft. Connector Strips that weigh more than 2.5lbs/ft shall not be acceptable.
 - d. Two connector panels supporting power and data outlets shall be supported for each 1ft / 30.5cm section of strip and shall be mounted on individual 125mm panels. Provide quantity of lighting connectors for power corresponding with quantity of circuits indicated for each connector strip.
 - e. Frames and connector panels shall be fabricated from 3mm die cast aluminum finished in black, fine-textured powder coat paint.
 - f. Circuits shall be labeled above each connector on the front of the strip using 15mm reverse silk screened lexan labels. All labels match connector strip finish with contrasting color circuit designations. Optional write-on labels shall be available upon request, connector strips that do not support write-on labels shall not be acceptable.
 - g. Connector strips shall be supplied with appropriate brackets and hardware for mounting to new rigging system.
 - h. Connector strips shall utilize junction brackets on 6ft / 152cm centers and support spans up to 12ft / 305cm between hanger brackets.
 - i. Mounting brackets shall be 45mm x 3mm and 45mm x 1.9mm ASTM A5008 steel. All mounting hardware shall conform to ISO 898-1 class 8.8.
4. Electrical
- a. Connector strip shall support 120V/60Hz power input per branch circuit with support for multiple outlets wired to each circuit.
 - b. The connector strip wiring terminal box shall support a maximum of eight 20A inputs utilized for:
 - a. Up to six circuits for power distribution along the length of the connector strip.
 - b. One circuit dedicated for work lights.
 - c. One circuit for DMX Active Pass-thru connectors
 - c. The connector strip terminal box shall support hardwired or pluggable connector power and data input.
 - d. Pluggable power and data inputs shall be fed by a single multi-conductor cable and a single DMX or Ethernet cable. The LKS data connector by Link S.r.l. or Link USA, Inc shall be supported, connector strips that do not support the LKS data connector shall not be accepted.
 - e. Power output connectors shall be available as 20A grounded stage pin, 20A Twist-Lock, 20A "U" ground (dual rated "T-slot"), and 20A Neutrik powerCON TRUE1. Connector strips that utilize connectors that are not rated for plugging hot loads shall not be accepted.

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- f. Terminations shall be consolidated at one end and utilize feed-through terminals individually labeled with corresponding circuit numbers. Provide at end nearest associated electrical panelboard.
 - a. Performance lighting circuits shall utilize tension clamp terminals listed for AWG 20 – 8 / 0.5mm² – 6mm² gauge wire.
 - b. Work light and DMX Active Pass-thru circuits shall use tension clamp terminals listed for AWG 20 – 12 / 0.5mm² – 4mm² gauge wire.
 - c. Terminals that place a screw directly on the wire are not acceptable.
- g. A low voltage data distribution system shall be supported to incorporate DMX/ RDM (ANSI E1.11-2008 USITT DMX512-A and ANSI E1.20 Remote Device Management) or Ethernet (IEEE 802.3).
 - a. Ethernet connections shall utilize standard RJ-45 connection.
 - b. DMX output ports shall utilize 5-pin XLR style connectors.
 - c. Connector strips shall utilize a voltage barrier to accommodate class 2 wiring in the same strip as class one circuits.
 - d. Low voltage signals shall enter the connector strip via a strain relief or connector mounted at the specified end of the connector strip. One low voltage cable shall be supported for each connector strip.
 - e. Connector strips with multiple DMX outputs shall use active DMX/RDM pass through assemblies. Each strip shall support up to 24 active DMX/RDM pass through assemblies.
 - f. DMX outputs without active splitting of the DMX/ RDM signal or that do not support RDM shall not be acceptable.
- 5. Pipe Batten
 - a. A pipe batten with a 48.3mm outside diameter constructed of 3.8mm extruded aluminum with a 3.8mm vertical web shall be available for use with the connector strip
 - b. The pipe batten shall be extruded with a witness line to indicate the position of the web
 - c. The pipe batten shall support a maximum distributed load of 150lb / 68kg over a 10ft / 305cm span.
 - d. The pipe batten shall support a maximum point load of 65lb / 29kg over a 10ft / 305cm span.
 - e. The pipe batten shall weigh no more than 1.5lbs/ft, battens that weighs more than 1.5lbs/ft shall not be acceptable.
 - f. The pipe batten shall be designed to a 10:1 safety factor.
 - g. The pipe batten shall be finished with black or clear hardcoat anodization.
- 6. Work Lights
 - a. Connector strips shall support optional integrated LED work lights.
 - b. Connector strips that do not support integrated LED work lights shall not be acceptable.
- 7. Junction Boxes
 - a. Gridiron junction boxes shall be available to accommodate “S” type cable wiring into connector strips mounted to non-fixed locations.
 - b. Junction boxes shall accommodate hardwired or pluggable cables including LKS data connector by Linek S.r.l. or Link USA, Inc. Junction boxes that do not support the LKS data connector shall not be acceptable.
 - c. Junction boxes shall be fabricated from 16-gauge cold rolled steel with 14-gauge end panels.

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- d. Cover(s) shall be 16-gauge cold rolled steel and hinged to allow mounting in any direction.
- e. Junction Boxes shall be finished with fine-textured, scratch-resistant, powder coat paint.

C. POWER DISTRIBUTION – OUTLET AND PIGTAIL BOXES

1. General

- a. Connectors shall be available as 20A, 50A and 100A grounded stage pin, 20A twist lock and 20A “U” ground (dual rated “T-slot”); other connectors shall be available as specified.
- b. Pigtails shall be three-wire type “S” jacketed cable sized for the maximum circuit ampacity.
- c. Pigtails with 20 amp stage pin connectors shall be terminated using 12 gauge 4 way indent crimp (with inspection window) type where the wire is inserted and crimped directly in the socket.
- d. Terminations for pigtail connectors shall utilize feed- through terminals individually labeled with corresponding circuit numbers.
 - a. 20 amp circuits shall use screwless tension clamp terminals listed for 20 – 8 gauge wire.
 - b. 50 amp circuits shall use compression terminals listed for 10 – 1 gauge wire.
 - c. 100 amp circuits shall use compression terminals listed for 8 – 2/0 gauge wire.
 - d. Terminals that place a screw directly on the wire are not acceptable.
- e. Outlet and pigtail boxes shall be supplied with appropriate brackets and hardware for mounting as shown on the drawings.
 - a. Standard mounting options shall include pipe or wall mounting.
 - b. Brackets shall be made from ASTM A36 steel.
 - c. Hardware shall be ASTM A307 grade 5.
- f. A low voltage distribution system shall be available to incorporate DMX, Ethernet or other protocols as specified in the power distribution box.
 - a. A voltage barrier shall be used to separate the low voltage wiring for the electrical circuits.
- g. Power distribution equipment shall be listed by a nationally recognized test lab (NRTL)

B. Physical

- a. Outlet and pigtail boxes shall be 6.25” H x 3.3” D and fabricated from 18-gauge galvanized steel and finished in black fine-texture powder coat paint.
 - a. Covers shall be fabricated from 16-gauge galvanized steel.
- b. Outlet and pigtail boxes shall be available in any length specified in increments of 3-inches with a maximum length of up to 3-feet.
- c. Pigtails and outlets shall be spaced on 18” centers or as otherwise specified.
- d. Outlets shall be mounted on individual 3” panels.
- e. Circuits shall be labeled with 1.25” lettering.
 - a. Circuit labeling options shall include:
 - 1) Circuits shall be labeled on the front side of the connector strip with white lettering on black background labels.
 - 2) Circuits shall be labeled on front and back sides of the connector strip with white lettering on black background labels.
 - 3) Circuits shall be labeled on the front side of the connector strip with engraved lamacoid labels utilizing white lettering on black background labels.

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- 4) Circuits shall be labeled on the front and rear sides of the connector strip with engraved lamacoid labels utilizing white lettering on black background labels.
 - 5) Circuits shall be labeled on one side of the connector strip using individual circuit cover plates with lettering engraved in the cover and filled with the specified color.
 - 6) Circuits shall be labeled using specified labeling per plans and drawings.
- f. Outlet and pigtail boxes shall support optional LED indicators to indicate the presence of power at each local circuit. The indicator shall be red in color and mounted in outlet or pigtail box.
- a. The LED indicator shall be mounted in the lower right corner of the outlet panel.
 - b. The LED indicator shall be mounted in the bottom of the outlet or pigtail box directly below the outlet panel.
 - c. The LED indicator shall be mounted in the cover plate directly below the circuit label for pigtail circuits.

2.3 UNISON DRd Series PARADIGM ARCHITECTURAL CONTROL SYSTEM.

A. DrD Series External Processing Rack.

1. The DRd shall be upgraded to the latest processor.
2. Mechanical External control station processors shall be housed in the Unison ERn2 rack mount enclosure as manufactured by Electronic Theatre Controls, Inc. The rack shall provide Unison architectural station control for Unison, Sensor, and DMX512 controlled relay panels. The rack should be of sufficient size to house the DrD plus all related equipment, including Ethernet Switch, ETCNet Patch panel, gateways and opti-splitters, and any other equipment required to make the system operate.
3. The DRd Rack shall be rack mounted in a wall mounted rack enclosure constructed of 18 gauge formed steel panels with a hinged, lockable full-height door containing an integral electrostatic air filter. The rack door shall have an opening to allow limited access to the control module face panel.
4. All rack components shall be properly treated and finished. Exterior surfaces shall be finished in fine textured, scratch resistant, powder-based epoxy paint. Top, bottom, and side knockouts shall facilitate conduit entry.
5. DRd rack shall contain an integral electrostatic air filter and a single low-noise fan. The air filter shall be removable for easy cleaning. The fan shall maintain the temperature of all components at proper operating levels, provided the ambient temperature of the room does not exceed 40°C/104°F.
6. Racks shall be designed to allow easy insertion and removal of all control and option modules. Supports shall be provided for precise alignment of modules into power and signal connector blocks. With modules removed, racks shall provide clear front access to all power and control wire terminations.
7. Electrical:
 - A. External Processing Racks shall be available in 100, 120, 230 and 277 volt, single phase configurations. External Processing Racks shall be completely pre-wired by the manufacturer. The contractor shall provide input feed, load, and control wiring.

B. DRd Rack shall be designed to support the following wire terminations:

AC
Echelon link power (Belden 8471 or equivalent)
24Vdc (2- 16AWG Wire)
DMX512A Port A (In or Out) (Belden 9729 or equivalent)
DMX512A Port B (Out) (Belden 9729 or equivalent)
RS232 Serial In/Out (Belden 9729 or equivalent)
Unshielded Twisted Pair (UTP) Category 5/5e Ethernet
Contact Closure In (14AWG to 26AWG Wire)

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Contact Closure Out (14AWG to 26AWG Wire)
Contact Closure Out shall provide 1A @ 30vDC

- C. All control wire connections shall be terminated via factory provided connectors.
- D. Unison Control Stations.
 - 1. Preset/Fader Stations
 - A. Unison Heritage Preset/Fader stations shall operate using up to twelve programmable buttons and sixteen programmable faders with integral LEDs. Check design drawing for type and location of all UNISON Heritage control stations.
 - B. Touch Screen Control stations
 - 1. The lighting system upgrade shall include one 7" portable touch screen P-LCD-P with two wall receptacles in locations indicated in design drawings.
 - 2. The existing two wall-mounted touch screens shall be maintained.
 - C. Fader stations shall utilize standard 45 millimeter slide potentiometers.
 - D. All Preset and Fader stations shall have face plates, fader knobs, and buttons per design schematic. All face plates shall be designed for flush or surface mounting.
 - 1. Station faceplates shall be constructed of ABS plastic and shall use no visible means of attachment.
 - 2. The Manufacturer shall supply back-boxes for flush mounted half gang stations and for all surface mounted stations.
 - 2. Electrical
 - A. Unison Heritage control station wiring shall be an Echelon® Link power network.
 - B. Link power shall utilize low-voltage Class II unshielded twisted pair, type Belden 8471 or equivalent, and one #14 ESD drain wire (when not installed in grounded metal conduit).
 - C. Network wiring may be bus, loop, home-run or any combination of these.
 - D. Network insulation displacement connectors shall be provided with all stations.
 - 3. Functional
 - A. The Unison Control System shall be designed to allow control of lighting and associated systems via Preset/Fader, LCD, IR or Astronomical time clock controls. System shall allow the programming of presets, macros and time clock events.
 - B. System presets shall be programmable via Preset/Fader, LCD, or Light Manager software. Presets shall have a discrete fade time, programmable from zero to 1,000 hours with a resolution of one millisecond. Presets shall be selectable via button, fader, IR transmitter, time clock event, macro activation or switch interface stations.
 - C. System macros (sequences) shall be programmable via Light Manager system software. Macro sequence steps shall include preset selection, wall status change, station property change (template), zone property change, timed delay, jump to macro, and stop macro. Macro sequences shall be activated by button, time clock event or Light Manager software.
 - D. Station (Preset/Fader) control components shall be designed to operate standard default or custom system functions. Components shall operate default functions unless re-assigned via Light Manager, the Windows-based configuration program. Optional button functions include: preset selection, manual mode activation, record mode activation, station lockout, raise, lower, macro activation, cue light, or room join/separate. Optional fader functions include manual master control, individual zone control, fade rate control or preset master control. Stations (Preset/Fader, LCD and IR) shall allow programming of station and component electronic lock-out levels via Light Manager. LCD stations shall also allow programming of page pass-code and visibility levels.

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B. LIGHTING CONSOLE AND ACCESSORIES

1. General

- a. The lighting control console shall be a microprocessor-based system specifically designed to provide complete control of stage, studio, and entertainment lighting systems. The console shall be the ColorSource CS40 as manufactured by Electronic Theatre Controls, Inc., or equal.
- b. The system shall provide control of 512 DMX512A addresses on a maximum of forty (40) or eighty (80) control channels. Any or all of the DMX512A outputs may be controlled by a channel.
- c. A maximum of 999 cues may be contained in non-volatile electronic memory.
- d. Twenty (20) or forty (40) faders shall provide access to individual intensity channels, intensity for devices as well as playbacks.
- e. Four (4) configurable faders shall provide functionality for output of bump buttons, cue list control or crossfade control.
- f. The console shall have one (1) built-in 7" color multi-touch touchscreen. The touchscreen shall provide the primary interface for system configuration, programming show data and multi-parameter control.
- g. Six (6) softkey buttons shall be provided, five of which may be configured by the user.
- h. Console shall be equipped with an on-board help system, with on-board tutorial videos.
- i. Console shall not require the use of an external monitor for normal use.
- j. Console software upgrades shall be made by the user via USB drive. Changing internal components shall not be required.
- k. The console shall provide a USB port allowing show data to be saved for archival or transfer to other consoles or a personal computer.
- l. Systems that do not provide the above capabilities shall not be acceptable.

2. Controls and Playback

a. Patching

- a. The console shall provide patching facilities for dimmers and multi-parameter devices via a built in library of fixture definitions. The fixture library shall be updated via software based updates. It shall be possible to create custom fixture definitions using an offline application.
- b. The console shall support patching, address setting, and mode changes using Remote Device Management (RDM) on the local DMX/RDM port.

b. Channel or Playback Faders

- a. Twenty (20) or forty (40) proportional, fully overlapping faders shall be provided with 45mm potentiometers and bump buttons.
- b. The faders shall provide direct manual control of intensity for all channels. Channel levels can be changed at any time by using the individual channel faders or through the use of the touch screen interface.
 - 1) Faders shall also control up to ten (10) pages of twenty (20) (or forty (40)) recordable memories or sequences. Memories shall record user-selected channel levels. Sequences shall record user-selected memories or channel levels.
 - a) With color mixing systems, output of color from fixtures shall appear to be a combination of the active memories in a color space.

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- c. Programming Tools
 - a. The console shall provide a 7" color multi-touch touchscreen with six (6) softkeys, as well as touch-based controls. The LCD shall provide system configuration, programming show data and multi-parameter control.
 - b. Touch-based tools shall include:
 - 1) Forty (40) programmable color chips and color picker.
 - 2) Touch-based parameter controls.
 - 3) Virtual Level/Rate wheel.
 - 4) Virtual keypad for level entry.
 - 5) Customizable channel display using Stage Map. It shall be possible to rearrange the graphical representations for control channels to closely mimic the positions of fixtures in the venue.
 - 6) Effects (intensity, color, shape, and parameter)
 - a) It shall be possible to assign multiple effects to the same channel and parameters. The playback of those effects shall play levels back relative to the combination of the two effects.
 - c. Fixture selection shall be made via:
 - 1) Auto fixture selection on fader moves.
 - 2) Pressing the selection button under channel faders.
 - 3) Touching the channel icon in the stage map display on the touch screen.
 - 4) Fixture Tags for Quick Selects
 - a) Selection of multiple fixtures shall be possible through a special controls dock that groups channels together based on the channel tile positions within a pre-defined area in the topographical view for channels.
 - b) Selection shall be possible through the use of informational tags. Selecting a predefined tag selects all fixtures sharing that same tag. At least two tags may be assigned to any one channel.
 - c) There shall be at least 27 Quick Select groupings.
 - d. Two independent channels shall be provided with on/off functionality. Independents shall be patched in a location separate from patch.
 - d. Playback Controls
 - a. A cue list of up to 999 cues shall be provided. Cues may be made up of channel levels and parameter settings or contain a reference to a recorded memory. Cues shall be editable and shall be able to be individually deleted and inserted.
 - b. Playback Toy for filtered and timed execution of playbacks.
 - c. Multiple bump modes (Flash, Solo, SoloChange, Move/GO).
 - d. Full history rubberbanding for playbacks.
3. Interface Options
- a. The console shall provide connectors for the following:
 - a. 12V AC or DC input for external power supply
 - b. DMX512-A/RDM output (one (1) 5-pin XLR connector)
 - c. USB connection (one (1) type A connector)

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4. Physical
 - a. All operator controls and console electronics shall be housed in a single desktop console.
 - b. Size and weight:
 - a. Twenty (20) fader console shall be equal to or less than 18.31" (465mm) wide 11" (279mm) deep 2.36" (60mm) high (including controls), and 6.9 lbs. (3.13 kg.)
 - b. Forty (40) fader console shall be equal to or less than 26.31" (668mm) wide 11" (279mm) deep 2.36" (60mm) high (including controls) and 9.55 lbs. (4.33kg).
 - c. Twenty (20) fader console shall be able to be mounted into a 19" equipment rack with the use of additional mounting hardware.
 - d. Console power shall be 12V AC or DC via an external power unit. The power unit shall operate with 90-265VAC line voltage, 50 or 60Hz. Console is provided with a universal power supply.

2.4 ECHO SMART SWITCH PASS THROUGH BREAKER/RELAY PANELS

- A. A Smart Switch Relay Panel will be provided by Lighting Contractor to operate theatrical LED instruments, stage work lights and running lights as indicated on contract drawings. Electrical Contractor will provide a circuit panelboard to feed the Relay Panel, and organize load circuits as required to meet switching requirements.
 1. Model required:
 - a. ERP##-FT## 1P + DMX Interface+Realtime Clock x 1Panel, refer to drawings for additional requirements.
 2. Accessories
 - a. Provide Unison push button control stations and touch screens and touch screen receptacles as indicated in design drawings.
 - b. House light lock out will be accomplished via programming on the Unison Paradigm system.
 - c. Refer to design drawings for number of 1-pole relay kits as required.
 - d. Refer to design drawings for number of 2- pole relay kits as required.

2.5 PORTABLE STAGE LIGHTING FIXTURES

Color mixing Light Emitting Diode Cyclorama fixture.

2. General
 - a. The fixture shall be a color-mixing high-intensity LED illuminator with DMX control of intensity and color. Basis of Design: ColorSource® CYC as manufactured by Electronic Theatre Controls, Inc. or approved equal.
 - b. All LED fixtures shall be provided by a single manufacturer to ensure compatibility.
 - c. The fixture shall be UL 1573 listed for stage and studio use.
 - d. The fixture shall comply with the USITT DMX512-A standard.
3. Physical
 - a. The fixture shall be contained in a rugged all-metal die-cast housing, free of burrs and pits.
 - b. The housing shall have a rugged black powder coat finish.
 - c. Power supply and electronics shall be integral to each unit.
 - d. Fixture housing shall provide built in spill control .
 - e. Fixture shall operate directly on the ground or by hanging via yoke.

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- f. The unit shall ship with:
 - a. Theatrical-style hanging yoke as standard.
 - b. 5' power lead with Neutrik® PowerCON™ to Edison connector as standard.
- g. Available options shall include but not be limited to:
 - a. DMX input via RJ45 connector.
- h. Light output shall be produce an asymmetrical beam.
 - a. Lensing shall be designed to provide smooth coverage both horizontally and vertically for seamless blending from fixture to fixture.
 - b. With a minimum setback from the cyclorama of 2', the fixtures shall be able to achieve a 2-to-1 spacing ration and maintain smooth coverage.
- 4. THERMAL
 - a. The fixture shall be natural convection cooled and shall not use a fan.
 - b. The fixture shall utilize advanced thermal management systems to maintain LED life to an average of 70% intensity after 50,000 hours of use.
 - c. The fixture shall operate in an ambient temperature range of 0°C (32°F) minimum, to 40° C (104°F) maximum ambient temperature.
- 5. ELECTRICAL
 - a. The fixture shall be equipped with 100V to 240V 50/60 Hz internal power supply.
 - b. The fixture shall support power in and thru operation.
 - a. Power in shall be via Neutrik® PowerCON™ input connector.
 - b. Power thru shall be via Neutrik ® PowerCON™ output connector.
 - c. Fixture power wiring and accessory power cables shall be rated to support linking of multiple fixtures up to the capacity of a 15A breaker.
 - c. The fixture requires power from non-dim source.
 - d. Power supply shall have power factor correction.
- 6. LED Emitters
 - a. The fixture shall contain 5 different LED colors to provide color characteristics as described in Section H below.
 - b. All LEDs used in the fixture shall be high brightness and proven quality from established and reputable LED manufacturers.
 - c. Manufacturer of LED emitters shall utilize an advanced production LED binning process to maintain color consistency.
 - d. LED emitters should be rated for nominal 50,000-hour LED life to 70% intensity.
 - e. Fixtures shall have a flicker free mode that will set the LED refresh rate to 25,000 Hz for flicker free operation on camera.
- 7. Warranty
 - a. The fixture shall be provided with the minimum warranty:
 - a. 5 years full fixture coverage
 - b. 10 years LED coverage

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8. CALIBRATION
 - a. Fixture shall be calibrated at factory for achieve consistent color between fixtures built at different times and/or from different LED lots or bins.
 - a. Calibration data shall be stored in the fixture as a permanent part of on-board operating system.
 - b. All arrays, including replacement arrays shall be calibrated to the same standard to ensure consistency.
 - c. Fixtures not offering LED calibration shall not be acceptable.
 - b. Fixture shall have droop compensation to overcome thermal droop in the LEDs to maintain output levels and color point.
9. COLOR
 - a. The fixture shall utilize a minimum of 42 LED emitters.
 - a. These emitters shall be made up of Red, Green, Blue, Indigo and Lime
10. DIMMING
 - a. The LED system shall use 15-bit nonlinear scaling techniques for high-resolution dimming.
 - b. The dimming curve shall be optimized for smooth dimming over longer timed fades.
 - c. The LED system shall be digitally driven using high-speed pulse width modulation (PWM)
 - d. LED control shall be compatible with broadcast equipment in the following ways:
 - a. PWM control of LED levels shall be imperceptible to video cameras and related equipment.
 - b. PWM rates shall be adjustable by the user via RDM to avoid any visible interference to video cameras and related equipment.
11. CONTROL AND USER INTERFACE
 - a. The fixture shall be USITT DMX512-A compatible via In and Thru 5-pin XLR connectors or RJ45 connectors.
 - b. The fixture shall be compatible with the ANSI RDM E1.20 standard.
 - a. All fixture functions shall accessible via RDM protocol for modification from suitably equipped control console
 - b. Temperature sensors within the luminaire shall be viewable in real time via RDM.
 - c. Fixtures not offering RDM compatibility, feature set access or temperature monitoring via RDM shall not be compatible.
 - c. The fixture shall be equipped with a 7-segment display for easy-to-read status and control.
 - d. The fixture shall be equipped with a three-button user-interface.
 - e. The fixture shall offer multiple control modes including but not limited to:
 - a. RGB
 - b. 5 channel (IRGBS)
 - c. Direct
 - d. Single channel
 - f. The fixture shall operate in Regulated mode for droop compensation.
 - g. The fixture shall offer stand-alone functionality eliminating the need for a console.
 - a. Fixture shall ship with 12 preset colors accessible as a stand-alone feature.

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- b. Fixture shall ship with 5 Sequences accessible as a stand-alone feature.
- c. Each preset can be modified by the end user.
- d. Fixtures can be linked together with standard DMX cables and controlled from designated master fixture.
 - 1) Up to 32 fixtures may be linked.
- e. Fixtures in a stand-alone state shall restore to the settings present prior to power cycling, eliminating the need for reprogramming.
- f. Fixtures without stand-alone operation features described in a, b, c, d, and e shall not be acceptable.

3.02 Color mixing Light Emitting Diode Wash fixture

1. General

- a. The fixture shall be a color-mixing high-intensity LED illuminator with DMX control, unless noted otherwise, of intensity and color. Basis of Design: ColorSource Par as manufactured by Electronic Theatre Controls, Inc. or approved equal.
- b. All LED fixtures shall be provided by a single manufacturer to ensure compatibility.
- c. The fixture shall be UL 1573 listed for stage and studio use.
- d. The fixture shall comply with the USITT DMX512-A standard.
- e. The fixture shall be provided with the minimum warranty of 5 years full fixture coverage and 10 years LED array coverage.
- f. The fixture shall have a LM-84 report with a L70 rating of no less than 55,000 hours.
 - 1) Substitutes must provide evidence of minimum L70 rating of no less than 55,000 hours.
 - a) If no LM-84 report is available, an acceptable alternate is a LM-80 report on all emitters with a LM-79 report and an in-situ temperature measurement test verifying the conditions of the fixture meet the conditions of the LM-80 report
 - b) All tests and reports must be completed by a Nationally Recognized Testing Laboratory
 - c) All tests must be conducted to IES standards.

2. Physical

- a. The fixture shall be contained in a rugged all-metal die-cast housing, free of burrs and pits.
- b. The housing shall have a rugged black powder coat finish.
- c. Power supply, cooling and electronics shall be integral to each unit.
- d. Fixture housing shall provide two easy-access slots for secondary lenses and other accessories.
 - a. Slots shall be equipped with locking retaining clip.
- e. The unit shall ship with:
 - a. Theatrical-style hanging yoke as standard with C-clamp.
 - b. 5' power lead with Edison connector as standard
 - c. Safety cable
 - d. Secondary lens: Medium PAR lens
 - e. Available options shall include but not be limited to:

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- f. Floor stand conversion Kit
 - g. Bare-end, Stage-Pin or Twist-lock type-equipped power leads
 - h. powerCON to powerCON cables for fixture power linking.
 - i. Multiple secondary lens options to include multiple angles in the following patterns:
 - 1) Linear
 - 2) Round
 - 3) Oblong
 - f. Light output shall be via a round aperture.
 - a. Aperture and accessory slots shall accommodate standard 7.5" accessories such as used in other similar-sized fixtures.
 - b. Accessories available as options shall include but not be limited to:
 - 1) Gel/diffusion frames
 - 2) Top hats
 - 3) Barndoors
 - 4) Egg crate louvers
 - 5) Concentric ring louvers
 - 6) Multiple secondary lensing options
3. THERMAL
- a. The fixture shall be cooled with a variable speed fan.
 - b. The fixture shall utilize advanced thermal management systems to maintain LED life to an average of 70% intensity after 20,000 hours of use for color mixing versions and 36,000 hours of use for Pearl variety.
 - a. Thermal management shall include multiple temperature sensors within the housing to include:
 - 1) The LED array.
 - 2) The control board.
 - c. The fixture shall operate in an ambient temperature range of 0°C (32°F) minimum, to 40° C (104°F) maximum ambient temperature.
4. ELECTRICAL
- a. The fixture shall be equipped with 100V to 240V 50/60 Hz internal power supply.
 - b. The fixture shall support power in and thru operation.
 - a. Power in shall be via Neutrik® powerCON™ input connector.
 - b. Power thru shall be via Neutrik ® powerCON™ output connector.
 - c. Fixture power wiring and accessory power cables shall be rated to support linking of multiple fixtures up to the capacity of a 15A breaker.
 - c. The fixture requires power from non-dim source.
 - d. Power supply outputs shall have self-resetting current limiting protection.
 - e. Power supply shall have power factor correction.
5. LED Emitters
- a. The fixture shall contain 4 different LED colors to provide color characteristics or two color temperature white LEDs for the Pearl products, as described in Section H below.
 - b. All LEDs used in the fixture shall be high brightness and proven quality from established and reputable LED manufacturers.
 - a. Fixture shall utilize Luxeon® Z™ LED emitters.

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- c. Manufacturer of LED emitters shall utilize an advanced production LED binning process to maintain color consistency.
 - d. LED emitters should be rated for nominal 20,000-hour L70 rating for color mixing versions and 36,000-hour L70 rating for Pearl variant.
 - e. LED system shall comply with all relevant patents.
6. CALIBRATION
- a. Fixture shall be calibrated at factory for achieve consistent color between fixtures built at different times and/or from different LED lots or bins.
 - a. Calibration data shall be stored in the fixture as a permanent part of on-board operating system.
 - b. All arrays, including replacement arrays shall be calibrated to the same standard to insure consistency.
 - c. Fixtures not offering LED calibration shall not be acceptable.
7. COLOR
- a. The fixture shall utilize a minimum of 40 LED emitters.
 - a. These emitters shall be made up of Red, Green, Blue and Lime for ColorSource
8. DIMMING
- a. The LED system shall use 15-bit nonlinear scaling techniques for high-resolution dimming.
 - b. The dimming curve shall be optimized for smooth dimming over longer timed fades.
 - c. The LED system shall be digitally driven using high-speed pulse width modulation (PWM)
 - d. LED control shall be compatible with broadcast equipment in the following ways:
 - a. PWM control of LED levels shall be imperceptible to video cameras and related equipment.
 - b. PWM rates shall be adjustable by the user via RDM to avoid any visible interference to video cameras and related equipment.
9. CONTROL AND USER INTERFACE
- a. The fixture shall be USITT DMX512-A compatible via In and Thru 5-pin XLR connectors.
 - b. The fixture shall be compatible with the ANSI RDM E1.20 standard.
 - a. All fixture functions shall accessible via RDM protocol for modification from suitably equipped control console
 - b. Temperature sensors within the luminaire shall be viewable in real time via RDM.
 - c. Fixtures not offering RDM compatibility, feature set access or temperature monitoring via RDM shall not be compatible.
 - c. The fixture shall be equipped with a 7-segment display for easy-to-read status and control.
 - d. The fixture shall be equipped with a three-button user-interface.
 - e. The fixture shall offer RGB control.
 - f. The fixture shall operate in Regulated mode for droop compensation.
 - g. The fixture shall offer stand-alone functionality eliminating the need for a console.
 - a. Fixture shall ship with 12 preset colors accessible as a stand-alone feature.
 - b. Fixture shall ship with 5 Sequences accessible as a stand-alone feature.
 - c. Each color and sequence can be modified by the end user.

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- d. Fixtures can be linked together with standard DMX cables and controlled from designated master fixture.
 - 1) Up to 32 fixtures may be linked.
- e. Fixtures in a stand-alone state shall restore to the settings present prior to power cycling, eliminating the need for reprogramming.
- f. Fixtures without stand-alone operation features described in a, b, c, d, and e shall not be acceptable.

3.03 Color mixing or White-light Light Emitting Diode Profile Fixture

1. General

- a. The fixture shall be a color-mixing high-intensity LED illuminator with DMX control of intensity and color. Basis of Design: ColorSource Spot manufactured by Electronic Theatre Controls, Inc. or approved equal.
- b. All LED fixtures shall be provided by a single manufacturer to ensure compatibility.
- c. The fixture shall be UL 1573 listed for stage and studio use.
- d. The fixture shall comply with the USITT DMX512-A standard.
- e. The fixture shall be provided with the minimum warranty of 5 years full fixture coverage and 10 years LED array coverage
- f. ColorSource Spot
 - a. The fixture shall have a LM-84 report with a L70 rating of no less than 54,000 hours.
 - 1) Substitutes must provide evidence of minimum L70 rating of no less than 54,000 hours.
 - a) If no LM-84 report is available, an acceptable alternate is a LM-80 report on all emitters with a LM-79 report and an in-situ temperature measurement test verifying the conditions of the fixture meet the conditions of the LM-80 report.
 - b) All tests and reports must be completed by a Nationally Recognized Testing Laboratory
 - c) All tests must be conducted to IES standards.

2. Physical

- a. The unit shall be constructed of rugged, die cast aluminum, free of burrs and pits.
- b. The following shall be provided:
 - a. Lens secured with silicone shock mounts.
 - b. Shutter assembly shall allow for +/-25° rotation.
 - c. 20 gauge stainless steel shutters
 - d. Interchangeable lens tubes for different field angles with Teflon guides for smooth tube movement
 - e. Sturdy integral die cast gel frame holders with two accessory slots, and a top-mounted, quick release gel frame retainer
 - f. Rugged steel yoke with two mounting positions allowing 300°+ rotation of the fixture within the yoke.
 - g. Positive locking, hand operated yoke clutch
 - h. Slot with sliding cover for motorized pattern devices or optional iris
- c. The housing shall have a rugged black powder coat finish.

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- d. Power supply, cooling and electronics shall be integral to each unit.
 - e. The unit shall ship with:
 - a. Theatrical-style hanging yoke as standard with C-clamp.
 - b. 5' cable with Neutrik powerCON™ to choice of connector as standard.
 - c. Gate diffuser
 - d. A-size pattern holder
 - e. Components outlined in 3.04(2).b.
 - f. Available options shall include but not be limited to:
 - a. Bare-end, Stage-Pin or Twist-lock type-equipped power leads
 - b. powerCON to powerCON cables for fixture power linking.
 - c. Smooth Wash Diffuser for overlapping beams of light from multiple fixtures
3. Optical
- a. The light beam should have a 2-to-1 center-to-edge drop-off ratio.
 - b. The unit shall provide, but not be limited to:
 - a. Low gate and beam temperature
 - b. Sharp imaging through a three-plane shutter design
 - c. The unit shall provide, but not be limited to:
 - a. 5, 10, 14, 19, 26, 36-, 50-, 70- and 90-degree field angles
 - b. High-quality pattern imaging
 - c. Sharp shutter cuts without halation
 - d. Shutter warping and burnout in normal use shall be unacceptable.
 - e. Adjustable hard and soft beam edges
 - d. 19-, 26-, 36-, and 50-degree units shall have optional lens tubes available for precision, high-contrast imaging.
 - e. Shall work with S4 LED CYC and Fresnel adapters.
4. Environmental and Agency Compliance
- a. The fixture shall be ETL and cETL LISTED and/or CE rated and shall be so labeled when delivered to the job site.
 - b. The fixture shall be ETL LISTED to the UL1573 standard for stage and studio use
 - c. The fixture shall be rated for IP-20 dry location use.
5. Thermal
- a. Fixture shall be equipped with a cooling fan.
 - b. The fixture shall utilize advanced thermal management systems to maintain LED life to an average of 70% intensity after 54,000 hours of use for color mixing versions and 36,000 hours for Pearl.
 - a. Thermal management shall include multiple temperature sensors within the housing to include:
 - 1) LED array circuit board temperatures
 - 2) Fixture ambient internal temperature
 - c. The fixture shall operate in an ambient temperature range of 0°C (32°F) minimum, to 40° C (104°F) maximum ambient temperature.
6. Electrical
- a. The fixture shall be equipped with a 100V to 240V 50/60Hz internal power supply.

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- b. The fixture shall support power in and thru operation.
 - a. Power in shall be via Neutrik® powerCON™ input connector.
 - b. Power thru shall be via Neutrik ® powerCON™ output connector.
 - c. Fixture power wiring and accessory power cables shall be rated to support linking of multiple fixtures up to the capacity of a 15A breaker.
 - c. The fixture requires power from a non-dim source.
 - d. Fixtures shall have droop compensation to prevent thermal shift of color or intensity.
 - e. Power supply outputs shall have self-resetting current-limiting protection.
 - f. Power supply shall have power factor correction.
7. LED Emitters
- a. The fixture shall contain a minimum of four different LED colors to provide color characteristics or two-color temperature white LEDs for the Pearl products, as described in the Color Section below .
 - b. All LEDs used in the fixture shall be high brightness and proven quality from established and reputable LED manufacturers.
 - c. Manufacturer of LED emitters shall utilize an advanced production LED binning process to maintain color consistency.
 - d. LED emitters should be rated for nominal 54,000-hour L70 rating for color mixing versions and 36,000-hour L70 rating for Pearl variant.
 - e. LED system shall comply with all relevant patents.
8. Calibration
- a. Fixture shall be calibrated at factory for achieve consistent color and intensity output between fixtures built at different times and/or from different LED lots or bins.
 - a. Calibration data shall be stored on the control card as a permanent part of on-board operating system.
 - b. All arrays, including replacement arrays shall be calibrated to the same standard to insure consistency.
 - c. Fixtures not offering LED calibration shall not be acceptable.
9. Color
- a. The fixture shall utilize a minimum of 60 LED emitters
 - a. These emitters shall be made up of Red, Green, Blue and Lime
 - b. These emitters shall be made up of Red, Green, Indigo and Lime
 - c. These emitters shall be made up of 2700 K and 6500 K
10. Dimming
- a. The LED system shall use 15-bit nonlinear scaling techniques for high-resolution dimming.
 - b. The fixture shall utilize an Incandescent dimming curve.
 - c. Dimming curve shall be optimized for smooth dimming over longer timed fades.
 - d. The LED system shall be digitally driven using high-speed pulse width modulation (PWM)
 - e. LED control shall be compatible with broadcast equipment in the following ways:
 - a. PWM control of LED levels shall be imperceptible to video cameras and related equipment.
 - b. PWM shall be capable of being set via RDM to 25,000hz.

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11. Control and User interface
- a. The fixture shall be USITT DMX512-A compatible via In and Thru 5-pin XLR connectors or RJ45 connectors.
 - b. The fixture shall be compatible with the ANSI RDM E1.20 standard.
 - a. All fixture functions shall accessible via RDM protocol for modification from suitably equipped control console
 - b. Temperature sensors within the luminaire shall be viewable in real time via RDM.
 - c. Fixtures not offering RDM compatibility, feature set access or temperature monitoring via RDM shall not be compatible.
 - c. The fixture shall be equipped with a 7-segment display.
 - d. The fixture shall be equipped with a three-button user-interface.
 - e. A variable-rate strobe channel shall be provided.
 - f. The fixture shall offer stand-alone functionality eliminating the need for a console.
 - a. Fixture shall ship with 12 preset colors or color temperatures accessible as a stand-alone feature.
 - b. Fixture shall ship with 5 sequences accessible as a stand-alone feature.
 - c. Each color and sequence can be modified by the end user via RDM.
 - d. Fixtures can be linked together with standard DMX cables and controlled from designated master fixture.
 - 1) Up to 32 fixtures may be linked.
 - e. Fixtures in a stand-alone state shall restore to the settings present prior to power cycling, eliminating the need for reprogramming.
 - f. Fixtures without stand-alone operation features described above shall not be acceptable

END OF SECTION

**SECTION 26 0500
COMMON WORK RESULTS FOR ELECTRICAL**

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Electrical equipment coordination and installation.
 - 2. Sleeves for raceways and cables.
 - 3. Sleeve seals.
 - 4. Grout.

1.3 DEFINITIONS

- A. EPDM: Ethylene-propylene-diene terpolymer rubber.
- B. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

- A. Product Data: For sleeve seals.

1.5 COORDINATION

- A. Coordinate arrangement, mounting, and support of electrical equipment:
 - 1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
 - 2. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.
- B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

PART 2 PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Sleeves for Rectangular Openings: Galvanized sheet steel.
 - 1. Minimum Metal Thickness:
 - a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side more than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).
 - b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches (1270 mm) and 1 or more sides equal to, or more than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.2 SLEEVE SEALS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.
 - 1. Sealing Elements: EPDM or NBR interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
 - 2. Pressure Plates: Carbon steel. Include two for each sealing element.
 - 3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

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PART 3 EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- A. Comply with NECA 1.
- B. Comply with applicable provisions of Occupational Safety and Health Act (OSHA), NFPA Standards and Pamphlets, NEIS Standards, and common work place practice.
- C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.
- B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
- D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.
- E. Cut sleeves to length for mounting flush with both surfaces of walls.
- F. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.
- G. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable, unless indicated otherwise.
- H. Seal space outside of sleeves with grout for penetrations of concrete and masonry
 - 1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.
- I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint.
- J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials.
- K. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using cast-iron pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.
- M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

3.3 SLEEVE-SEAL INSTALLATION

- A. Install to seal exterior wall penetrations.
- B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 FIRESTOPPING

- A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly.

END OF SECTION 260500

**SECTION 26 0505
SELECTIVE DEMOLITION FOR ELECTRICAL**

PART 1 GENERAL

- 1.1 SECTION INCLUDES
 - A. Electrical demolition.
- 1.2 RELATED REQUIREMENTS
 - A. Section 01 7000 - Execution and Closeout Requirements: Additional requirements for alterations work.
- 1.3 SUBMITTALS
 - A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
 - B. Sustainable Design Documentation: Submit certification of removal and appropriate disposal of abandoned cables containing lead stabilizers.

PART 2 PRODUCTS

- 2.1 MATERIALS AND EQUIPMENT
 - A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 EXECUTION

- 3.1 EXAMINATION
 - A. Verify that abandoned wiring and equipment serve only abandoned facilities.
 - B. Demolition drawings are based on casual field observation and existing record documents.
 - C. Report discrepancies to Architect before disturbing existing installation.
 - D. Beginning of demolition means installer accepts existing conditions.
- 3.2 PREPARATION
 - A. Disconnect electrical systems in walls, floors, and ceilings to be removed.
 - B. Coordinate utility service outages with utility company.
 - C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.
 - D. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.
 - 1. Obtain permission from Owner at least 24 hours before partially or completely disabling system.
 - 2. Make temporary connections to maintain service in areas adjacent to work area.
- 3.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK
 - A. Perform work for removal and disposal of equipment and materials containing toxic substances regulated under the Federal Toxic Substances Control Act (TSCA) in accordance with applicable federal, state, and local regulations. Applicable equipment and materials include, but are not limited to:
 - 1. PCB-containing electrical equipment, including transformers, capacitors, and switches.
 - 2. PCB- and DEHP-containing lighting ballasts.
 - 3. Mercury-containing lamps and tubes, including fluorescent lamps, high intensity discharge (HID), arc lamps, ultra-violet, high pressure sodium, mercury vapor, ignitron tubes, neon, and incandescent.
 - B. Remove, relocate, and extend existing installations to accommodate new construction.
 - C. Remove abandoned wiring to source of supply.
 - D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
 - E. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.
 - F. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

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- G. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.
- H. Repair adjacent construction and finishes damaged during demolition and extension work.
- I. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.
- J. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

3.4 CLEANING AND REPAIR

- A. Clean and repair existing materials and equipment that remain or that are to be reused.
- B. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

END OF SECTION

SECTION 26 0519
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Single conductor building wire.
- B. Wiring connectors.
- C. Electrical tape.
- D. Wire pulling lubricant.
- E. Cable ties.

1.2 RELATED REQUIREMENTS

- A. Section 26 0526 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.

1.3 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, with Editorial Revision (2020).
- D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation 2004 (Reapproved 2020).
- E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape 2017.
- F. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- G. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy 2021.
- 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 44 - Thermoset-Insulated Wires and Cables Current Edition, Including All Revisions.
- K. UL 83 - Thermoplastic-Insulated Wires and Cables Current Edition, Including All Revisions.
- L. UL 486A-486B - Wire Connectors Current Edition, Including All Revisions.
- M. UL 486C - Splicing Wire Connectors Current Edition, Including All Revisions.
- N. UL 486D - Sealed Wire Connector Systems Current Edition, Including All Revisions.
- O. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape Current Edition, Including All Revisions.

1.4 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.

1.5 QUALITY ASSURANCE

- A. Conform to 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.

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1.6 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

1.7 FIELD CONDITIONS

PART 2 PRODUCTS

2.1 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. Underground feeder and branch-circuit cable is not permitted.
- E. Armored cable is not permitted.
- F. Metal-clad cable is not permitted.

2.2 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. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- D. Comply with NEMA WC 70.
- E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
- G. Conductors for Grounding and Bonding: Also comply with Section 26 0526.
- H. 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.
- I. Minimum Conductor Size: 12 AWG.
 - 1. Branch Circuits: 12 AWG.
 - a. Exceptions:
 - 1) Theatrical lighting circuits: 10 AWG.
- J. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- K. Conductor Color Coding:
 - 1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
 - 2. Color Coding Method: Integrally colored insulation.
 - a. Conductors size 4 AWG and larger may have black insulation color coded using vinyl color coding electrical tape.
 - 3. Color Code:
 - a. 480Y/277 V, 3 Phase, 4 Wire System:
 - 1) Phase A: Brown.
 - 2) Phase B: Orange.
 - 3) Phase C: Yellow.
 - 4) Neutral/Grounded: Gray.
 - b. 208Y/120 V, 3 Phase, 4 Wire System:
 - 1) Phase A: Black.
 - 2) Phase B: Red.

- 3) Phase C: Blue.
- 4) Neutral/Grounded: White.
- c. Equipment Ground, All Systems: Green.

2.3 SINGLE CONDUCTOR BUILDING WIRE

- A. Description: Single conductor insulated wire.
- B. Conductor Stranding:
 - 1. Feeders and Branch Circuits:
 - a. Size 10 AWG and larger: Solid.
 - b. Size 12 AWG: Stranded.
- C. Insulation Voltage Rating: 600 V.
- D. Insulation:
 - 1. Copper Building Wire: Type THHN/THWN-2, except as indicated below.

2.4 WIRING CONNECTORS

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
- B. Connectors for Grounding and Bonding: Comply with Section 26 0526.
- 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. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
- E. 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.
- F. Mechanical Connectors: Provide bolted type or set-screw type.
- G. Compression Connectors: Provide circumferential type or hex type crimp configuration.
- H. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.

2.5 WIRING ACCESSORIES

- A. Electrical Tape:
 - 1. 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).
 - 2. 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).
- B. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.
- C. Cable Ties: Material and tensile strength rating suitable for application.

PART 3 EXECUTION

3.1 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.

3.2 PREPARATION

- A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.3 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. Include circuit lengths required to install connected devices within 10 ft (3.0 m) of location indicated.
 - 4. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
 - 5. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
 - 6. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is permitted, under the following conditions:
 - a. Provide no more than six current-carrying conductors in a single raceway. Dedicated neutral conductors are considered current-carrying conductors.
 - b. Increase size of conductors as required to account for ampacity derating.
 - c. Size raceways, boxes, etc. to accommodate conductors.
 - 7. 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.
- B. Install products in accordance with manufacturer's instructions.
- C. Perform work in accordance with NECA 1 (general workmanship).
- D. Installation in Raceway:
 - 1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
 - 2. Pull all conductors and cables together into raceway at same time.
 - 3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
 - 4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
- E. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
- F. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
 - 1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.
- G. Terminate cables using suitable fittings.
- H. Install conductors with a minimum of 12 inches (300 mm) of slack at each outlet.
- I. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- J. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
- K. Make wiring connections using specified wiring connectors.

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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.
- L. 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.
- M. Insulate ends of spare conductors using vinyl insulating electrical tape.
- N. 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.
- O. Install firestopping to preserve fire resistance rating of partitions and other elements, using UL approved materials and methods.
- P. 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.

3.4 FIELD QUALITY CONTROL

- A. See Section 01 4000 - 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 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.
- D. Correct deficiencies and replace damaged or defective conductors and cables.

END OF SECTION

**SECTION 26 0526
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Grounding and bonding requirements.
- B. Conductors for grounding and bonding.
- C. Connectors for grounding and bonding.
- D. Ground bars.

1.2 RELATED REQUIREMENTS

- A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
- B. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.3 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. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems 2021.
- D. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. UL 467 - Grounding and Bonding Equipment Current Edition, Including All Revisions.

1.4 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 the contract documents. Obtain direction before proceeding with work.
- B. Sequencing:
 - 1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.5 QUALITY ASSURANCE

- A. Conform to 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.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 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. 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.

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2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
7. Provide bonding for interior metal air ducts.

2.2 GROUNDING AND BONDING COMPONENTS

A. General Requirements:

1. Provide products listed, classified, and labeled as suitable for the purpose intended.
2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 0526:

1. Use insulated copper conductors unless otherwise indicated.

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 mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.

a. Exceptions:

- 1) Use exothermic welded connections for connections to metal building frame.

PART 3 EXECUTION

3.1 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.

3.2 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. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 4. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- D. Identify grounding and bonding system components in accordance with Section 26 0553.

3.3 FIELD QUALITY CONTROL

- A. Inspect and test in accordance with NETA ATS except Section 4.
- B. Perform inspections and tests listed in NETA ATS, Section 7.13.
- C. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.
- D. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

E. Submit detailed reports indicating inspection and testing results and corrective actions taken.

END OF SECTION

**SECTION 26 0529
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.2 RELATED REQUIREMENTS

- A. Section 26 0533.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.
- B. Section 26 0533.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.

1.3 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 2016a.
- 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.
- G. UL 5B - Strut-Type Channel Raceways and Fittings Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
 - 2. Coordinate the work with other trades to provide additional framing and materials required for installation.
 - 3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
 - 4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
 - 5. Notify Architect of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.5 QUALITY ASSURANCE

- A. Comply with NFPA 70.
- B. Comply with applicable building code.
- C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of four times the applied force.
- E. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.
- F. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:

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1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported with a minimum safety factor of 2.5. Include consideration for vibration, equipment operation, and shock loads where applicable.
4. Do not use products for applications other than as permitted by NFPA 70 and product listing.
5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
 - a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
 - b. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
 - c. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Conduit and Cable Supports: Straps, clamps, etc. suitable for the 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.
- C. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- D. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.
- E. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
 1. Comply with MFMA-4.
 2. Channel (Strut) Used as Raceway (only where specifically indicated): Listed and labeled as complying with UL 5B.
 3. Minimum Channel Thickness: Steel sheet, 12 gage, 0.1046 inch (2.66 mm).
 4. Minimum Channel Dimensions: 1-5/8 inch (41 mm) width by 13/16 inch (21 mm) height.
- F. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
 1. Minimum Size, Unless Otherwise Indicated or Required:
 - a. Equipment Supports: 1/2 inch (13 mm) diameter.
 - b. Busway Supports: 1/2 inch (13 mm) diameter.
 - c. Single Conduit up to 1 inch (27 mm) trade size: 1/4 inch (6 mm) diameter.
 - d. Single Conduit larger than 1 inch (27 mm) trade size: 3/8 inch (10 mm) diameter.
 - e. Trapeze Support for Multiple Conduits: 3/8 inch (10 mm) diameter.
 - f. Outlet Boxes: 1/4 inch (6 mm) diameter.
 - g. Luminaires: 1/4 inch (6 mm) diameter.
- G. Non-Penetrating Rooftop Supports for Low-Slope Roofs: Steel pedestals with thermoplastic or rubber bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified.
 1. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
 2. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.
 3. Mounting Height: Provide minimum clearance of 6 inches (150 mm) under supported component to top of roofing.
- H. Anchors and Fasteners:
 1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
 2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.

3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
4. Hollow Masonry: Use toggle bolts.
5. Hollow Stud Walls: Use toggle bolts.
6. Steel: Use beam clamps, machine bolts, or welded threaded studs.
7. Sheet Metal: Use sheet metal screws.
8. Wood: Use wood screws.
9. Plastic and lead anchors are not permitted.
10. Powder-actuated fasteners are not permitted.
11. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
 - a. Comply with MFMA-4.
 - b. Channel Material: Use galvanized steel.
 - c. Manufacturer: Same as manufacturer of metal channel (strut) framing system.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive support and attachment components.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- D. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- E. Install support and attachment components for steel conduits in accordance with NECA 101
- F. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- G. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- H. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- I. Equipment Support and Attachment:
 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
 4. Unless otherwise indicated, mount floor-mounted equipment on properly sized 3 inch (80 mm) high concrete pad constructed in accordance with Section concrete pads.
 5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- J. Conduit Support and Attachment: Also comply with Section 26 0533.13.
- K. Box Support and Attachment: Also comply with Section 26 0533.16.
- L. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.
- M. Secure fasteners according to manufacturer's recommended torque settings.
- N. Remove temporary supports.
- O. Identify independent electrical component support wires above accessible ceilings (only where specifically indicated or permitted) with color distinguishable from ceiling support wires in accordance

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with NFPA 70.

- P. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 4. To Existing Concrete: Expansion anchor fasteners.
 - 5. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
 - 6. To Light Steel: Sheet metal screws.
 - 7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet anchorage requirements.

3.3 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Inspect support and attachment components for damage and defects.
- C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

**SECTION 26 0533.13
CONDUIT FOR ELECTRICAL SYSTEMS**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Galvanized steel rigid metal conduit (RMC).
- B. Intermediate metal conduit (IMC).
- C. Flexible metal conduit (FMC).
- D. Liquidtight flexible metal conduit (LFMC).
- E. Electrical metallic tubing (EMT).
- F. Conduit fittings.
- G. Accessories.

1.2 RELATED REQUIREMENTS

- A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables.
- B. Section 26 0526 - Grounding and Bonding for Electrical Systems.
 - 1. Includes additional requirements for fittings for grounding and bonding.
- C. Section 26 0529 - Hangers and Supports for Electrical Systems.
- D. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.3 REFERENCE STANDARDS

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC) 2020.
- B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S) 2020.
- C. ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit 2018.
- D. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- E. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT) 2020.
- F. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC) 2017.
- G. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable 2014.
- H. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. UL 1 - Flexible Metal Conduit Current Edition, Including All Revisions.
- J. UL 6 - Electrical Rigid Metal Conduit-Steel Current Edition, Including All Revisions.
- K. UL 360 - Liquid-Tight Flexible Metal Conduit Current Edition, Including All Revisions.
- L. UL 514B - Conduit, Tubing, and Cable Fittings Current Edition, Including All Revisions.
- M. UL 797 - Electrical Metallic Tubing-Steel Current Edition, Including All Revisions.
- N. UL 1242 - Electrical Intermediate Metal Conduit-Steel Current Edition, Including All Revisions.

1.4 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 the 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.

1.5 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.

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- B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 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. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit.
- D. Exposed, Interior, Not Subject to Physical Damage: Use intermediate metal conduit (IMC) or electrical metallic tubing (EMT).
- E. 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.
- F. 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. Motors.
 - b. Theatrical Lighting Outlet Assemblies on Stage
- G. Fished in Existing Walls, Where Necessary: Use flexible metal conduit.
- H. PVC shall not be used on project.

2.2 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. Fittings for Grounding and Bonding: Also comply with Section 26 0526.
- C. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.
- D. Provide products listed, classified, and labeled as suitable for the purpose intended.
- E. Minimum Conduit Size, Unless Otherwise Indicated:
 - 1. Branch Circuits: 3/4 inch (21 mm) trade size.
 - 2. Controls Cabling: 1 inch trade size, unless otherwise required to be larger based on associated cabling quantities.
 - 3. Branch Circuit Homeruns: 3/4 inch (21 mm) trade size.
- F. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.3 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- B. Fittings:
 - 1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.

- 3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.4 INTERMEDIATE METAL CONDUIT (IMC)

- A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.
- B. Fittings:
 - 1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.
 - 3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.5 FLEXIBLE METAL CONDUIT (FMC)

- A. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.
- B. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.

2.6 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

- A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.
- B. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.

2.7 ELECTRICAL METALLIC TUBING (EMT)

- A. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- B. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel.
 - 3. Connectors and Couplings: Use compression (gland) type.
 - a. Do not use indenter type connectors and couplings.
 - b. Do not use set-screw type connectors and couplings.
 - 4. Damp or Wet Locations (where permitted): Use fittings listed for use in wet locations.
 - 5. Embedded Within Concrete (where permitted): Use fittings listed as concrete-tight. Fittings that require taping to be concrete-tight are not acceptable.

2.8 ACCESSORIES

- A. Conduit Joint Compound: Corrosion-resistant, electrically conductive; suitable for use with the conduit to be installed.
- B. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.
- C. Pull Strings: Use nylon cord with average breaking strength of not less than 200 pound-force (890 N).
- D. Sealing Compound for Sealing Fittings: Listed for use with the particular fittings to be installed.
- E. Modular Seals for Conduit Penetrations: Rated for minimum of 40 psig; Suitable for the conduits to be installed.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field measurements are as indicated.

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- B. Verify that mounting surfaces are ready to receive conduits.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
- D. Install intermediate metal conduit (IMC) in accordance with NECA 101.
- E. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.
- F. Conduit Routing:
 - 1. Unless dimensioned, conduit routing indicated is diagrammatic.
 - 2. When conduit destination is indicated without specific routing, determine exact routing required.
 - 3. Conceal all conduits unless specifically indicated to be exposed.
 - 4. Conduits in the following areas may be exposed, unless otherwise indicated:
 - a. Electrical rooms.
 - b. Mechanical equipment rooms.
 - c. Within joists in areas with no ceiling.
 - 5. Unless otherwise approved, do not route conduits exposed:
 - a. Across floors.
 - b. Across roofs.
 - c. Across top of parapet walls.
 - d. Across building exterior surfaces.
 - 6. 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.
 - 7. Arrange conduit to maintain adequate headroom, clearances, and access.
 - 8. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
 - 9. Arrange conduit to provide no more than 150 feet (46 m) between pull points.
 - 10. Route conduits above water and drain piping where possible.
 - 11. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
 - 12. Maintain minimum clearance of 6 inches (150 mm) between conduits and piping for other systems.
 - 13. 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.
 - 14. Group parallel conduits in the same area together on a common rack.
- G. Conduit Support:
 - 1. Secure and support conduits in accordance with NFPA 70 and Section 26 0529 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 metal channel (strut) with accessory conduit clamps to support multiple parallel surface-mounted conduits.
 - 5. Use conduit clamp to support single conduit from beam clamp or threaded rod.
 - 6. Use trapeze hangers assembled from threaded rods and metal channel (strut) with accessory conduit clamps to support multiple parallel suspended conduits.

7. Use of wire for support of conduits is not permitted.
 8. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with the most stringent requirements.
- H. Connections and Terminations:
1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
 2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
 3. Use suitable adapters where required to transition from one type of conduit to another.
 4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
 5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
 6. Where spare conduits stub up through concrete floors and are not terminated in 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.
- I. Penetrations:
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
 2. Make penetrations perpendicular to surfaces unless otherwise indicated.
 3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
 4. Conceal bends for conduit risers emerging above ground.
 5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
 6. Provide suitable modular seal where conduits penetrate exterior wall below grade.
 7. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
 8. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
- J. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
 2. Where conduits are subject to earth movement by settlement or frost.
- K. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
1. Where conduits pass from outdoors into conditioned interior spaces.
 2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
- L. 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.
- M. Provide grounding and bonding in accordance with Section 26 0526.
- N. Identify conduits in accordance with Section 26 0553.

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3.3 FIELD QUALITY CONTROL

- A. See Section 01 4000 - 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. Correct deficiencies and replace damaged or defective conduits.

3.4 CLEANING

- A. Clean interior of conduits to remove moisture and foreign matter.

3.5 PROTECTION

- A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION

**SECTION 26 0533.16
BOXES FOR ELECTRICAL SYSTEMS**

PART 1 GENERAL

1.1 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).

1.2 RELATED REQUIREMENTS

- A. Section 26 0529 - Hangers and Supports for Electrical Systems.
- B. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.3 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 (Reaffirmed 2020).
- E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- F. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations Current Edition, Including All Revisions.
- H. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.
- I. UL 508A - Industrial Control Panels Current Edition, Including All Revisions.
- J. UL 514A - Metallic Outlet Boxes Current Edition, Including All Revisions.

1.4 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 the contract documents. Obtain direction before proceeding with work.

1.5 QUALITY ASSURANCE

- A. Conform to 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.

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1.6 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 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 suitable concrete type boxes where flush-mounted in concrete.
- 4. Use suitable masonry type boxes where flush-mounted in masonry walls.
- 5. Use raised covers suitable for the type of wall construction and device configuration where required.
- 6. Use shallow boxes where required by the type of wall construction.
- 7. Do not use "through-wall" boxes designed for access from both sides of wall.
- 8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
- 9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
- 10. 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.
- 11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):

- 1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
- 2. NEMA 250 Environment Type, Unless Otherwise Indicated:
 - a. Indoor Clean, Dry Locations: Type 1, galvanized 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.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that mounting surfaces are ready to receive boxes.
- B. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install 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. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.
- E. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.

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- F. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.
- G. Box Locations:
 - 1. Unless dimensioned, box locations indicated are approximate.
 - 2. Locate boxes as required for devices installed under other sections or by others.
 - 3. Locate boxes so that wall plates do not span different building finishes.
 - 4. Locate boxes so that wall plates do not cross masonry joints.
 - 5. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
 - 6. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches (150 mm) horizontal separation unless otherwise indicated.
 - 7. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches (610 mm) horizontal separation.
 - 8. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
 - a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches (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.
 - 9. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:
 - a. Concealed above accessible suspended ceilings.
 - b. Within joists in areas with no ceiling.
 - c. Electrical rooms.
 - d. Mechanical equipment rooms.
- H. Box Supports:
 - 1. Secure and support boxes in accordance with NFPA 70 and Section 26 0529 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.
 - 3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
- I. Install boxes plumb and level.
- J. 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.
- K. Install boxes as required to preserve insulation integrity.
- L. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- M. Close unused box openings.

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- N. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
- O. Provide grounding and bonding in accordance with Section 26 0526.
- P. Identify boxes in accordance with Section 26 0553.

3.3 CLEANING

- A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

3.4 PROTECTION

- A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

END OF SECTION

**SECTION 26 0553
IDENTIFICATION FOR ELECTRICAL SYSTEMS**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Electrical identification requirements.
- B. Identification nameplates and labels.
- C. Wire and cable markers.
- D. Voltage markers.
- E. Warning signs and labels.

1.2 RELATED REQUIREMENTS

- A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.

1.3 REFERENCE STANDARDS

- A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs 2011 (Reaffirmed 2017).
- B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels 2011 (Reaffirmed 2017).
- 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 2021.
- E. UL 969 - Marking and Labeling Systems Current Edition, Including All Revisions.

1.4 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.

1.5 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.

1.6 FIELD CONDITIONS

- A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

PART 2 PRODUCTS

2.1 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 equipment as follows:
 - a. Panelboards:
 - 1) Identify ampere rating.
 - 2) Identify voltage and phase.
 - 3) Identify power source and circuit number. Include location.
 - 4) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
 - 5) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
 - b. Enclosed switches, circuit breakers, and motor controllers:
 - 1) Identify voltage and phase.
 - 2) Identify power source and circuit number. Include location.

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- 3) Identify load(s) served. Include location.
 - c. Theatrical Outlet Boxes and Outlet Assemblies:
 - 1) Identify planmark ID.
 - 2) Identify power source and circuit number.
 2. Use identification nameplate to identify equipment utilizing series ratings, where permitted, in accordance with NFPA 70.
 3. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.
 4. Use identification label on inside of door at each fused switch to identify required NEMA fuse class and size.
 - C. Identification for Conductors and Cables:
 1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 0519.
 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 identification labels 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.
 2. Use identification labels or plastic marker tags to identify spare conduits at each end. Identify purpose and termination location.
 - E. Identification for Boxes:
 1. Use voltage markers to identify highest voltage present.
 2. Use voltage markers or color coded boxes to identify systems other than normal power system.
 3. Use identification labels 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. Wiring Device and Wallplate Finishes: Comply with Section 26 2726.
 2. 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.
- ## 2.2 IDENTIFICATION NAMEPLATES AND LABELS
- A. Identification Nameplates:
 1. Materials:
 - a. Indoor Clean, Dry Locations: Use plastic nameplates.
 - b. **Black nameplate with white engraved letters.**
 2. 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).

- 3. Stainless Steel Nameplates: Minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
- 4. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch (0.8 mm); engraved or laser-etched text.
- 5. 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. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
 - 2. 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. Equipment Designation: 1/2 inch (13 mm).
 - 5. Color:
 - a. Normal Power System: White text on black background.

2.3 WIRE AND CABLE MARKERS

- A. 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.
- B. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.
- C. Legend: Power source and circuit number or other designation indicated.
- D. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
 - 1. Do not use handwritten text.
- E. Minimum Text Height: 1/8 inch (3 mm).
- F. Color: Black text on white background unless otherwise indicated.

2.4 VOLTAGE MARKERS

- A. Markers for Conduits: Use factory pre-printed self-adhesive vinyl, self-adhesive vinyl cloth, or vinyl snap-around type markers.
- B. Markers for Boxes and Equipment Enclosures: Use factory pre-printed self-adhesive vinyl or self-adhesive vinyl cloth type markers.
- C. Minimum Size:
 - 1. Markers for Conduits: As recommended by manufacturer for conduit size to be identified.
 - 2. Markers for Pull Boxes: 1 1/8 by 4 1/2 inches (29 by 110 mm).
 - 3. Markers for Junction Boxes: 1/2 by 2 1/4 inches (13 by 57 mm).
- D. Legend:
 - 1. Markers for Voltage Identification: Highest voltage present.
 - 2. Markers for System Identification:
- E. Color: Black text on orange background unless otherwise indicated.

PART 3 EXECUTION

3.1 PREPARATION

- A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.2 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:

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1. Surface-Mounted Equipment: Enclosure front.
 2. Flush-Mounted Equipment: Inside of equipment door.
 3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
 4. Elevated Equipment: Legible from the floor or working platform.
 5. Branch Devices: Adjacent to device.
 6. Interior Components: Legible from the point of access.
 7. Conduits: Legible from the floor.
 8. Boxes: Outside face of cover, unless located in public view: inside face.
 9. Conductors and Cables: Legible from the point of access.
 10. Devices: Outside face of cover.
 11. Theatrical Outlet Boxes: 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. Secure rigid signs using stainless steel screws.
- G. Mark all handwritten text, where permitted, to be neat and legible.
- 3.3 FIELD QUALITY CONTROL
- A. See Section 01 4000 - 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

**SECTION 26 2416
PANELBOARDS**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Lighting and appliance panelboards.
- B. Overcurrent protective devices for panelboards.

1.2 RELATED REQUIREMENTS

- A. Section 26 0526 - Grounding and Bonding for Electrical Systems.
- B. Section 26 0529 - Hangers and Supports for Electrical Systems.
- C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- D. Section 26 0573 - Power System Studies: Additional criteria for the selection and adjustment of equipment and associated protective devices specified in this section.

1.3 REFERENCE STANDARDS

- A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service 2013e, with Amendment (2017).
- B. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
- C. NECA 407 - Standard for Installing and Maintaining Panelboards 2015.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- E. NEMA PB 1 - Panelboards 2011.
- F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less 2013.
- G. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems 2021.
- H. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations Current Edition, Including All Revisions.
- J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations Current Edition, Including All Revisions.
- K. UL 67 - Panelboards Current Edition, Including All Revisions.
- L. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures Current Edition, Including All Revisions.

1.4 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 the contract documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

- A. See Section 01 3000 - 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.
- 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

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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.
- 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 01 6000 - Product Requirements, for additional provisions.
 2. Panelboard Keys: Two of each different key.

1.6 QUALITY ASSURANCE

- A. Conform to requirements of NFPA 70.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.7 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.

1.8 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

2.1 MANUFACTURERS

- A. ABB/GE
- B. Eaton Corporation
- C. Schneider Electric; Square D Products
- D. Siemens Industry, Inc
- E. Source Limitations: Furnish panelboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.2 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 fully rated panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
- 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 250, and list and label as complying with UL 50 and UL 50E.
 - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - a. Indoor Clean, Dry Locations: Type 12 .
 - 2. Boxes: Galvanized steel unless otherwise indicated.
 - a. Provide wiring gutters sized to accommodate the conductors to be installed.
 - 3. Fronts:
 - a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.
 - b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
 - c. 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. Multi-Section Panelboards: Provide enclosures of the same height, with feed-through lugs or sub-feed lugs and feeders as indicated or as required to interconnect sections.
- K. Load centers are not acceptable.
- L. Provide the following features and accessories where indicated or where required to complete installation:
 - 1. Feed-through lugs.
 - 2. Sub-feed lugs.

2.3 LIGHTING AND APPLIANCE PANELBOARDS

- A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated.
- 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 Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
 - 2. Phase and Neutral Bus Material: Aluminum.
 - 3. Ground Bus Material: Aluminum.
- D. Circuit Breakers: Thermal magnetic bolt-on type.
- E. Enclosures:
 - 1. Provide surface-mounted enclosures.
 - 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.

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2.4 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.
 - 2) 14,000 rms symmetrical amperes at 480 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. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
6. Provide listed switching duty rated circuit breakers with SWD marking for all lighting circuits..
7. Do not use tandem circuit breakers.
8. Do not use handle ties in lieu of multi-pole circuit breakers.

2.5 SOURCE QUALITY CONTROL

- A. Factory test panelboards according to NEMA PB 1.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.
- B. Verify that mounting surfaces are ready to receive panelboards.
- C. Coordinate the panelboard and the surface to be mounted on or in.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 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 supports in accordance with Section 26 0529.
- 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 26 0526.
- I. Install all field-installed branch devices, components, and accessories.
- J. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.
- K. Set field-adjustable circuit breaker tripping function settings as determined by overcurrent protective device coordination study performed according to Section 26 0573.
- L. Provide filler plates to cover unused spaces in panelboards.
- M. Identify panelboards in accordance with Section 26 0553.

3.3 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.

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- C. 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 250 amperes. Tests listed as optional are not required.
- D. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.4 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.

3.5 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

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**SECTION 26 2726
WIRING DEVICES**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Wall switches.
- B. Receptacles.
- C. Wall plates.

1.2 RELATED REQUIREMENTS

- A. Section 26 0533.16 - Boxes for Electrical Systems.
- B. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
- C. Section 27 1000 - Structured Cabling: Voice and data jacks.

1.3 REFERENCE STANDARDS

- A. FS W-C-596 - Connector, Electrical, Power, General Specification for 2014h, with Amendments (2017).
- B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush Mounted (General Specification) 2014g, with Amendment (2017).
- 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 1472 - Solid-State Dimming Controls Current Edition, Including All Revisions.
- M. UL 1917 - Solid-State Fan Speed Controls Current Edition, Including All Revisions.

1.4 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. Notify Architect of any conflicts or deviations from the 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.

1.5 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.
- C. Field Quality Control Test Reports.
- D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- E. Operation and Maintenance Data:
 - 1. GFCI Receptacles: Include information on status indicators.

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- F. Project Record Documents: Record actual installed locations of wiring devices.
- G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 01 6000 - Product Requirements, for additional provisions.

1.6 QUALITY ASSURANCE

- A. Conform to 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.

1.7 DELIVERY, STORAGE, AND PROTECTION

- A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

PART 2 PRODUCTS

2.1 WIRING DEVICE APPLICATIONS

- A. Provide wiring devices suitable for intended use and with ratings adequate for load served.
- B. Provide tamper resistant receptacles for receptacles installed in subset of assembly occupancies described in 518.2 to include places of waiting transportation, gymnasiums, skating rinks, and auditoriums.
- C. Provide GFCI protection for receptacles installed within 6 feet (1.8 m) of sinks.
- D. Provide GFCI protection for receptacles installed in kitchens.
- E. Provide GFCI protection for receptacles serving electric drinking fountains.

2.2 WIRING DEVICE FINISHES

- A. Finishes shall be selected upon shop drawing review.
- B. Wiring Devices, Unless Otherwise Indicated: Black with black nylon wall plate.

2.3 WALL SWITCHES

- A. Manufacturers:
 - 1. Hubbell Incorporated: www.hubbell.com/#sle.
 - 2. Cooper Wiring Devices
 - 3. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.
 - 4. Lutron
 - 5. 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 20and 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.

2.4 RECEPTACLES

- A. Manufacturers:
 - 1. Hubbell Incorporated: www.hubbell.com/#sle.
 - 2. Cooper Wiring Devices.
 - 3. 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 498and 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.

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2. NEMA configurations specified are according to NEMA WD 6.

C. Convenience Receptacles:

1. Tamper Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; single or duplex as indicated on the drawings.
2. 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 SE 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.
 - a. Provide test and reset buttons of same color as device.
2. Tamper Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type.

2.5 WALL PLATES

A. Manufacturers:

1. Hubbell Incorporated: www.hubbell-wiring.com/#sle.
2. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.
3. Source Limitations: Where wall controls are furnished as part of lighting control system, provide accessory matching receptacles and wallplates by the same manufacturer.

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.

C. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.

D. Galvanized Steel Wall Plates: Rounded corners and edges, with corrosion resistant screws.

E. Premarked Wall Plates: Factory labeled as indicated; hot stamped for nylon wall plates and engraved for metal wall plates.

PART 3 EXECUTION

3.1 EXAMINATION

- A. 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.
- B. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- C. Verify that final surface finishes are complete, including painting.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 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.

3.3 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 26 0533.16 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.

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- b. Wall Dimmers: 48 inches (1200 mm) above finished floor.
 - c. 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.
 - 5. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.
 - 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. Install wiring devices plumb and level with mounting yoke held rigidly in place.
 - J. Install wall switches with OFF position down.
 - K. Install vertically mounted receptacles with grounding pole on bottom and horizontally mounted receptacles with grounding pole on left.
 - L. 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.
 - M. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.
 - N. Identify wiring devices in accordance with Section 26 0553.
- 3.4 FIELD QUALITY CONTROL
- A. Inspect each wiring device for damage and defects.
 - B. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.
 - C. Test each receptacle to verify operation and proper polarity.
 - D. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.
 - E. Correct wiring deficiencies and replace damaged or defective wiring devices.
- 3.5 ADJUSTING
- A. Adjust devices and wall plates to be flush and level.
- 3.6 CLEANING
- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION

**SECTION 26 5100
INTERIOR LIGHTING**

PART 1 GENERAL

- 1.1 SECTION INCLUDES
 - A. Interior luminaires.
 - B. Ballasts and drivers.
 - C. Luminaire accessories.
- 1.2 RELATED REQUIREMENTS
 - A. Section
 - B. Section 26 0533.16 - Boxes for Electrical Systems.
 - C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.
 - D. Section 26 0923 - Lighting Control Devices: Automatic controls for lighting including occupancy sensors, outdoor motion sensors, time switches, outdoor photo controls, and daylighting controls.
 - E. Section 26 2726 - Wiring Devices: Manual wall switches and wall dimmers.
- 1.3 REFERENCE STANDARDS
 - A. 47 CFR 15 - Radio Frequency Devices current edition.
 - B. ANSI C82.11 - American National Standard for Lamp Ballasts - High Frequency Fluorescent Lamp Ballasts 2017.
 - C. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits 2002 (Corrigendum 2012).
 - D. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products 2019.
 - E. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources 2021.
 - F. NECA 1 - Standard for Good Workmanship in Electrical Construction 2015.
 - G. NECA/IESNA 500 - Standard for Installing Indoor Lighting Systems 2006.
 - H. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems 2006.
 - I. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts 2020.
 - J. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility 2012 (Reaffirmed 2018).
 - K. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
 - L. NFPA 101 - Life Safety Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
 - M. UL 1598C - Light-Emitting Diode (LED) Retrofit Luminaire Conversion Kits Current Edition, Including All Revisions.
 - N. UL 1598 - Luminaires Current Edition, Including All Revisions.
 - O. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products Current Edition, Including All Revisions.
- 1.4 ADMINISTRATIVE REQUIREMENTS
 - A. Coordination:
 - 1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.
 - 2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
 - 3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.

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- 4. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

1.5 SUBMITTALS

- A. See Section 01 3000 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings:
 - 1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
 - 2. Provide photometric calculations where luminaires are proposed for substitution upon request.
- C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
 - 1. LED Luminaires:
 - a. Include estimated useful life, calculated based on IES LM-80 test data.
 - b. Include IES LM-79 test report upon request.
 - 2. Ballasts: Include wiring diagrams and list of compatible lamp configurations.
 - 3. Lamps: Include rated life, color temperature, color rendering index (CRI), and initial and mean lumen output.
- D. Certificates for Dimming Ballasts: Manufacturer's documentation of compatibility with dimming controls to be installed.
- E. Field quality control reports.
- F. Operation and Maintenance Data: Instructions for each product including information on replacement parts.
- G. Project Record Documents: Record actual connections and locations of luminaires and any associated remote components.

1.6 QUALITY ASSURANCE

- A. Conform to 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.

1.7 DELIVERY, STORAGE, AND PROTECTION

- A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.
- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.8 FIELD CONDITIONS

- A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.9 WARRANTY

- A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for all LED luminaires, including drivers.
- C. Provide three year full warranty for fluorescent emergency power supply units.

PART 2 PRODUCTS

2.1 LUMINAIRE TYPES

- A. Furnish products as indicated in luminaire schedule included on the drawings.

2.2 LUMINAIRES

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.
- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- G. Recessed Luminaires:
 - 1. Ceiling Compatibility: Comply with NEMA LE 4.
 - 2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.
 - 3. Luminaires Recessed in Sloped Ceilings: Provide suitable sloped ceiling adapters.
- H. LED Luminaires:
 - 1. Components: UL 8750 recognized or listed as applicable.
 - 2. Tested in accordance with IES LM-79 and IES LM-80.
 - 3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

2.3 BALLASTS AND DRIVERS

- A. Drivers - General Requirements:
 - 1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
 - 2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.
 - 3. Electronic Drivers: Inrush currents not exceeding peak currents specified in NEMA 410.
 - 4. Operate for at least 50,000 hours at maximum case temperature and 90 percent non-condensing relative humidity.
 - 5. Provide thermal fold-back protection by automatically reducing power output (dimming) to protect LED driver and LED light engine/fixture from damage due to over-temperature conditions that approach or exceed the LED driver's maximum operating temperature at calibration point
 - 6. Provide integral recording of operating hours and maximum operating temperature to aid in troubleshooting and warranty claims.
 - 7. Designed and tested to withstand electrostatic discharges incurred during manufacturing, installation, or field troubleshooting without impairment of performance when tested according to IEC 61000-4-2.
 - 8. Manufactured in a facility that employs ESD reduction practices in compliance with ANSI/ESD S20.20.
 - 9. UL 8750 recognized or listed as applicable.
 - 10. NRTL Type TL rated where possible to allow for easier fixture evaluation and listing of different driver series.
 - 11. UL 1598C listed for field replacement as applicable.
 - 12. Designed and tested to withstand Category A surges of 4,000 V according to IEEE C62.41.2 without impairment of performance.
 - 13. Class A sound rating; inaudible in a 27 dBA ambient.
 - 14. Demonstrate no visible change in light output with a variation of plus or minus 10 percent change in line-voltage input.
 - 15. LED drivers of the same family/series to track evenly across multiple fixtures at all light levels.
 - 16. Employ integral fault protection up to 277 V to prevent LED driver damage or failure in the event of incorrect application of line-voltage to communication link inputs.
- B. LED Drivers
 - 1. Operate from input voltage of 120 V through 277 V at 50/60 Hz.

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- 2. Complies with FCC requirements of 47 CFR 15, for commercial applications at 120-277 V and residential applications at 120 V.
- 3. Total Harmonic Distortion (THD): Less than 20 percent at maximum power; complies with ANSI C82.11.
- 4. Class 2 output designed to withstand hot swap of LED loads; meets UL 1310 and CSA C22.2 No. 223.
- 5. Driver outputs to be short circuit protected, open circuit protected, and overload protected.
- C. Dimmable LED Drivers:
 - 1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.
 - 2. Control Compatibility: Fully compatible with the dimming controls to be installed.

2.4 ACCESSORIES

- A. Stems for Suspended Luminaires: Steel tubing, minimum 1/2" size, factory finished to match luminaire or field-painted as directed.
- B. Threaded Rods for Suspended Luminaires: Zinc-plated steel, minimum 1/4" size, field-painted as directed.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
- C. Verify that suitable support frames are installed where required.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 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.

3.3 INSTALLATION

- A. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of luminaires provided under this section.
- B. Install products in accordance with manufacturer's instructions.
- C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).
- D. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- E. Recessed Luminaires:
 - 1. Install trims tight to mounting surface with no visible light leakage.
 - 2. Luminaires Recessed in Fire-Rated Ceilings: Install using accessories and firestopping materials to meet regulatory requirements for fire rating.
- F. Suspended Luminaires:
 - 1. Unless otherwise indicated, specified mounting heights are to bottom of luminaire.
 - 2. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.
 - 3. Provide minimum of two supports for each luminaire equal to or exceeding 4 feet nominal length, with no more than 4 feet (1.2 m) between supports.
 - 4. Unless otherwise indicated, support pendants from swivel hangers.
- G. Install accessories furnished with each luminaire.
- H. Bond products and metal accessories to branch circuit equipment grounding conductor.
- I. Fluorescent Luminaires Controlled by Dual-Level Switching: Connect such that each switch controls the same corresponding lamps in each luminaire.

3.4 FIELD QUALITY CONTROL

- A. See Section 01 4000 - Quality Requirements, for additional requirements.
- B. Inspect each product for damage and defects.
- C. Operate each luminaire after installation and connection to verify proper operation.
- D. Test fluorescent emergency power supply units to verify proper operation upon loss of normal power supply.
- E. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.5 ADJUSTING

- A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.
- B. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Architect or authority having jurisdiction.

3.6 CLEANING

- A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.7 CLOSEOUT ACTIVITIES

- A. See Section 01 7800 - Closeout Submittals, for closeout submittals.
- B. See Section 01 7900 - Demonstration and Training, for additional requirements.
- C. Just prior to Substantial Completion, replace all lamps that have failed.

3.8 PROTECTION

- A. Protect installed luminaires from subsequent construction operations.

END OF SECTION