SECTION 00 0101
PROJECT TITLE PAGE

PROJECT MANUAL
FOR
JOHNSON COUNTY CONSERVATION
CANGLESKA WAKAN CELEBRATION BARN RENOVATION

OWNER:

Johnson County Conservation
2048 Highway 6 NW
Oxford, IA 52322

PROJECT NUMBER: 2240009800

PROJECT LOCATION:

Cangleska Wakan – Celebration Barn
4045 245th Street NE
Solon, IA 52333

ARCHITECT/ENGINEER:

Shive-Hattery, Inc.
4125 Westown Pkwy, Suite 100
West Des Moines, IA 50266

BIDS DUE DUE:

March 6, 2025
3:00 PM
FW Kent Park - Conservation Headquarters and Maintenance Facility
2048 Highway 6 NW
Oxford, IA 52322

NON-MANDATORY PREBID MEETING:

February 26, 2025
10:00 AM - 11:00 AM
Cangleska Wakan - Celebration Barn
4045 245th St NE
Solon, IA 52333

ISSUED FOR:

Issued for Construction

END OF SECTION

SECTION 00 0105

CERTIFICATIONS PAGE

STATE OF IOWA

	I hereby certify that the portion of this technical submission described below was prepared by me or under my direct supervision and responsible charge. I am a duly Licensed Architect under the laws of the State of Iowa. **Printed or typed name:** Natalie Oppedal _____ _____ **Signature** **Date** License Expires: 6-30-2027 Pages, Sheets, or Divisions covered by this Seal: Divisions 00, 01, 02, 03, 06, 07, 08, 09, 10, and 11

	I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa. _____ _____ **Signature** **Date** Printed or typed name: Jessica J. Dooley License Number: 27051 My license renewal date is: 12-31-2026 Pages, Sheets, or Divisions covered by this Seal: Divisions 21, 22, and 23

	I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa. _____ _____ **Signature** **Date** Printed or typed name: Matthew K. Gordon License Number: 19216 My license renewal date is: 12-31-2026 Pages, Sheets, or Divisions covered by this Seal: Divisions 26, 27, and 28

END OF SECTION

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SEE DRAWINGS COVER SHEET G000.

END OF SECTION

SECTION 00 1113

ADVERTISEMENT FOR BIDS

PROJECT: CANGLESKA WAKAN CELEBRATION BARN RENOVATION

BIDS DUE: March 6, 2025 at 3:00 PM

TO:

THE **Owner (HEREINAFTER REFERRED TO AS Owner):**

Johnson County Conservation

2048 Highway 6 NW

Oxford, IA 52322

Architect (hereinafter referred to as Architect/Engineer):

Shive-Hattery, Inc.

4125 Westown Pkwy, Suite 100

West Des Moines, IA 50266

NON-MANDATORY PREBID MEETING:

DATE: February 26, 2025

TIME: 10:00 AM - 11:00 AM

LOCATION: Cangleska Wakan Celebration Barn, 4045 245th St NE, Solon, IA 52333

TO: POTENTIAL BIDDERS

Sealed bids will be received by the Owner at FW Kent Park - Conservation Headquarters and Maintenance Facility, 2048 Highway 6 NW, Oxford, IA 52322 until 3:00 PM, Central Time, on March 6, 2025.

Sealed bids will be opened and publicly read at the FW Kent Park - Conservation Headquarters and Maintenance Facility, 2048 Highway 6 NW, Oxford, IA 52322 at 3:05 PM, Central Time, on March 6, 2025 or at such later time and place as may then be fixed.

Bids will be considered by the Owner at the March 11, 2025 Johnson County Conservation Board Meeting, at the Johnson County Administration Building, First Floor Room 120, 913 South Dubuque Street, Iowa City, Iowa 52240 at 5:30 PM, Central Time, or at such later time and place as may then be fixed.

The general nature of the work is as follows:

Renovations to the existing Cangleska Wakan Celebration Barn, including primarily interior renovations to the existing Celebration Barn, including complete catering prep kitchen remodel including equipment, interior demolition, plumbing, electrical, and electrical service, mechanical and architectural finishes. Minor improvements to the exterior are included as needed including electrical service replacement.

The work must commence in March 2025 and must reach Substantial Completion by June 16, 2025 and Final Completion on June 30, 2025.

Bidding documents may be examined online at and at the following location(s):

Rapids Reproductions, DFS Plan Room, Shive-Hattery Custom Portal, rapidsrepro.com
6015 Huntington Ct. NE, Cedar Rapids, IA 52402

Master Builders of Iowa mbionline.com, 221 Park Street, Des Moines, IA 50309
mbiplanroof-dsm@mbionline.com

Copies of the Bidding documents may be obtained by Bidders and Subbidders from Rapids Reproductions (rapidsrepro.com) in accordance with the Instructions to Bidders upon depositing the sum of fifty dollars ($50.00) for each set of documents. A Master Builders card may be presented in place of a deposit. The deposit will be refunded in full upon return of the documents in good condition within fourteen days after award of project.

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 corporate surety bond or bonds, acceptable to the Owner, for the faithful performance of the contract, in an amount equivalent to one hundred percent of the amount of the contract. The bidder's security shall be in an amount equivalent to 5% of the bid amount, and shall be in the form of a cashier's or certified check drawn on a bank in Iowa or a bank chartered under the laws of the United States of America, or a certified bank share draft drawn on a credit union in Iowa or chartered under the laws of the United States of America or a bid bond with corporate surety satisfactory to the Owner. The bid security will be held by the Owner until a contract is fully executed and bonds are approved by the Owner.

No bid may be withdrawn for a period of 30 days after the date of the scheduled closing time for the receipt of bids.

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.

Published by order of the Johnson County Conservation Board of Oxford, IA.

Publish: By no later than no later than February 7, 2025.

Submit your offer on the Bid Form provided. Bidders may supplement this form as appropriate.

END OF SECTION

SECTION 00 1115
NOTICE OF PUBLIC HEARING

CANGLESKA WAKAN CELEBRATION BARN RENOVATION

JOHNSON COUNTY CONSERVATION

To Whom It May Concern:

You are hereby notified that at 5:30 PM, Central Time on February 11, 2025, at the Johnson County Conservation Administration Building, First Floor Room 120, 913 South Dubuque Street, Iowa City, Iowa 52240, there will be a public hearing on the proposed plans, specifications, form of contract, and estimated cost of the project. Any persons interested may appear and file objections to the proposed plans, specifications, form of contract, or cost of such improvement.

The following is a description of the Public Improvement: Renovations to the Cangleska Wakan Celebration Barn. These renovations are primarily interior renovations to the existing Celebration Barn, including complete catering prep kitchen remodel including equipment, interior demolition, plumbing, electrical, and electrical service, mechanical and architectural finishes. Minor improvements to the exterior are included as needed including electrical service replacement.

The location of the project is as follows:

Cangleska Wakan Celebration Barn
4045 245th Street NE
Solon, IA 52333

Proposed drawings, specifications, form of contract and estimated total cost for consideration at the public hearing will be available by February 7, 2025 at the Johnson County Auditor's Office, 913 South Dubuque Street, First Floor, Iowa City, IA 52240 or at the office of the Johnson County Conservation Board, Operations Center, 2048 US-6 NW, Oxford, IA 52322. Approved bid documents will be available at www.rapidsreproplanroom.com beginning February 12, 2025.

Published by order of the Johnson County Conservation Board, Oxford, Iowa.

Publish: No later than February 7, 2025

END OF SECTION

SECTION 00 2113
INSTRUCTIONS TO BIDDERS

SUMMARY

AIA Document AIA A701 Instructions to Bidders, is the Instructions to Bidders and is hereby made a part of these Documents to the same extent as if bound herein. This form can be purchased from the American Institute of Architects State Office as follows:

AIA Iowa
400 Locust Street, Suite 100
Des Moines, IA 50309
Phone: 515-244-7502
Fax: 515-244-5347
www.aiaiowa.org

Refer to Document 00 2115 Supplementary Instructions to Bidders for additions and amendments to these Instructions to Bidders.

END OF SECTION

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 in March 2025, and must reach Substantial Completion by June 16, 2025 and Final Completion by June 30, 2025.

2.1.6 The Bidder is fully experienced and properly qualified to perform the class of work provided for herein, and that it is properly licensed, equipped, organized and financed to perform such work. The Bidder shall act as an independent contractor and not as the agent of Owner in performing the Contract. The Bidder shall maintain complete control over its employees and all of its subcontractors. Nothing contained in this Contract or any subcontract awarded by Bidder shall create any contractual relationship between any such subcontractor and Owner. The Bidder shall perform all work in accordance with its own methods subject to compliance with the Contract and shall adhere to the schedule of progress and completion deadlines.

2.1.7 The Bidder has included all work associated with the Contract Documents in their Bid, regardless of any direction given by or dictated by any Bid Depositories, other Agencies or Municipalities not specifically party to the Contract. The Bidder shall coordinate the scopes of work to be performed by themselves and their individual Subcontractors prior to bid sufficiently to ensure that all work associated with the Contract Documents, regardless of the Drawing or Specification Section in which they appear, are covered in the Bid.

2.1.8 The Bidder has familiarized themselves with federal, state, and local laws, ordinances, rules and regulations affecting performance of the Work and employment of labor.

2.1.9 The Bidder has not participated in collusion or fraud in preparation of the bid for this project and shall provide a non-collusion affidavit to accompany the submitted bid.

Add the following Paragraph 2.2 and Subparagraphs 2.2.1 thru 2.2.3:

2.2. Preference

2.2.1 The State of Iowa, its agencies, and its political subdivisions, including cities, school districts and public utilities are required by Iowa Code Section 73A.21 to require a reciprocal resident bidder and resident labor force preference.

2.2.2 A “Resident Bidder” means a person or entity authorized to transact business in the State of Iowa and having a place of business for transacting business within the state at which it is conducting and has conducted business for at least three years prior to the date of the first advertisement for the public improvement. If another state or foreign country has a more stringent definition of a resident bidder, the more stringent definition is applicable as to bidders from that state or foreign country.

ARTICLE 3: BIDDING DOCUMENTS

Delete Subparagraph 3.1.1 and substitute the following Subparagraph 3.1.1:

3.1.1 Copies of the Bidding documents may be obtained by Bidders and Subbidders at Rapids Reproductions (rapidsrepro.com; 415 Highland Ave, Suite 100, Iowa City, IA 52240) in accordance with the Instructions to Bidders upon depositing the sum of fifty dollars ($50.00) for each set of documents. A Master Builders card may be presented in place of a deposit. The deposit will be refunded in full upon return of the documents in good condition within fourteen days after award of contract.

Add subparagraphs 3.2.1.1, 3.2.1.2 and 3.2.1.3 as follows:

3.2.1.1 If a discrepancy between different parts of the contract documents exists, the more stringent or higher cost requirement shall apply.

3.2.1.2 Bidders will not be entitled to any additional compensation or any extension of the Contract Time for conditions that can be determined by examining the site and the Bidding and Contract Documents.

3.2.1.3 Prior to bid, it is the responsibility of each bidder, sub-contractor, and material supplier to examine the documents for the work of all trades that may have an effect on the work that the bidder, sub-contractor, or supplier intends to perform.

Add subparagraphs 3.3.2.1 and 3.3.2.2 as follows:

3.3.2.1 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.

3.3.2.2 Approval of a substitution request does not in any way diminish the contractor's obligation to meet the specified requirements or the Architect's design intent.

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:

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 Iowa.

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.

4.2 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 5% of the Bid Amount, and shall be in the form of a cashier's or certified check drawn on a bank in Iowa or a bank chartered under the laws of the United States, or a certified share draft drawn on a credit union in Iowa 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.

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: Johnson County Conservation Board

Address: 2048 Highway 6 NW, Oxford, IA 52322

BID FOR: JCC - Celebration Barn Renovation

or as applicable:

BID SECURITY FOR: JCC - Celebration Barn Renovation

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 non-mandatory pre-bid conference for the purpose of answering questions and providing information to prospective Bidders. The pre-bid conference will be held at Cangleska Wakan Celebration Barn, 4045 245th St NE, Solon, IA 52333 on February 26, 2025 at 10:00 AM - 11:00 AM.

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 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 4000
PROCUREMENT FORMS AND SUPPLEMENTS

PART 1 GENERAL

1.1 FORMS

A. Use the following forms for the specified purposes unless otherwise indicated elsewhere in the procurement requirements.

B. Instructions to Bidders: AIA A701.

C. Substitution Request Form (During Procurement): 00 4325 - Substitution Request Form.

D. Substitution Request Form (During Construction): 00 6325 - Substitution Request Form - During Construction.

E. Bid Form: Section 00 4100 - Bid Form.

F. Procurement Form Supplements:

1. Bid Security Form: AIA 310-2010 "Bid Bond".

G. Representations and Certifications:

1. Bidder Status Form: 00 4100.01.
2. Authorization to Transact Business: 00 4100.02.
3. Non-Collusion Affidavit: 00 4100.03.

1.2 REFERENCE STANDARDS

A. AIA A310 - Bid Bond; 2010.

B. AIA A701 - Instructions to Bidders; 2018.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 00 4100

BID FORM

PROJECT: JCC - CELEBRATION BARN RENOVATION

BID TO:	JOHNSON COUNTY CONSERVATION
	2048 HIGHWAY 6 NW, OXFORD, IA 52322
DELIVER BID TO:	FW KENT PARK - CONSERVATION HEADQUARTERS AND MAINTENANCE FACILITY
	2048 HIGHWAY 6 NW, OXFORD, IA 52322

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

BIDDER'S FULL NAME _____

ADDRESS _____

CITY, STATE, ZIP_____

BIDDER EMAIL ADDRESS _____

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.

1. 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.

2. The undersigned Bidder submits, herewith, bid security in accordance with the terms set forth in the Advertisement for Bids and Supplementary Instructions to Bidders.

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

DATE		NUMBER

4. 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.

5. 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.

6. BIDDER will complete the Work in accordance with the Contract Documents per Section 00 4201 Schedule of Bid Prices

Lump Sum
Bid Price _____ $ _____
(use words)

7. BIDDER agrees that the Work will be completed in accordance with the project schedule in the Advertisement for Bids.

8. 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.

9. 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.

10. The following documents are attached to and made a condition of this Bid:

a. Required Bid Security in the amount of _____ and in the form of _____. SUBMITTED IN A SEPARATE ENVELOPE.

b. 00 4100.01 - Bidder Status Form

c. 00 4100.02 - Authorization to Transact Business Worksheet

d. 00 4100.03- Non-Collusion Affidavit.

11. This Bid submitted on _____, 20____.

12. State Contractor License No._____.

13. 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.

14. 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 4100.01
BIDDER STATUS FORM

To be completed by all bidders	**Part A**
Please circle Yes or No for each of the following:	

Part 1 Bidder Status Form

1.1 IOWA BIDDER STATUS FORM

A. The Iowa Division of Labor Bidder Preference Law is required by Iowa Code 73A.21. and can be referenced here: http://www.iowadivisionoflabor.gov/bidder-preference-law

1. Iowa Bidder Status Form

YES	**NO**	**My company is authorized to transact business in Iowa**
		(To help you determine if your company is authorized, please review the worksheet on the next page).
YES	**NO**	**My company has an office to transact business in Iowa.**
YES	**NO**	**My company's office in Iowa is suitable for more than receiving mail, telephone calls, and e-mail.**
YES	**NO**	**My company has been conducting business in Iowa for at least 3 years prior to the first request for bids on this project.**
YES	**NO**	**My company is not a subsidiary of another business entity or my company is a subsidiary of another business entity that would qualify as a resident bidder in Iowa.**
		If you answered "Yes" for each question above, your company qualifies as a resident bidder. Please complete Parts B and D of this form.
		If you answered "No" to one or more questions above, your company is a nonresident bidder. Please complete Parts C and D of this form.

To be completed by resident bidders	**Part B**

My company has maintained offices in Iowa during the past 3 years at the following addresses:

Dates: _____/_____/_____ to _____/_____/_____ Address: _____

City, State, Zip: _____

Dates: _____/_____/_____ to _____/_____/_____ Address: _____

City, State, Zip: _____

Dates: _____/_____/_____ to _____/_____/_____ Address: _____

City, State, Zip: _____

You may attach additional sheet(s) if needed.

To be completed by non-resident bidders	Part C

1. Name of home state or foreign country reported to the Iowa Secretary of State:

2. Does your company's home state or foreign country offer preferences to bidders who are residents? (Circle one) YES NO

3. If you answered "Yes" to question 2, identify each preference offered by your company's home state or foreign country and the appropriate legal citation.

_____

You may attach additional sheet(s) if needed.

To be completed by all bidders	Part D

I certify that the statements made on this document are true and complete to the best of my knowledge and I know that my failure to provide accurate and truthful information may be a reason to reject my bid.

Firm name: _____

Signature: _____ **Date:** _____

You must submit the completed form to the government body requesting bids per 875 Iowa Administrative Code Chapter 156. This form has been approved by the Iowa Labor Commissioner.

END OF SECTION

SECTION 00 4100.02
AUTHORIZATION TO TRANSACT BUSINESS WORKSHEET

This worksheet may be used to help complete Part A of the Resident Bidder Status form. If at least one of the following describes your business, you are authorized to transact business in Iowa. Circle Yes or No.

YES	**NO**	**My business is currently registered as a contractor with the Iowa Division of Labor.**
YES	**NO**	**My business is sole proprietorship & I am an Iowa resident for Iowa income tax purposes.**
YES	**NO**	**My business is a general partnership or joint venture. More than 50 percent of the general partners or joint venture parties are residents of Iowa for Iowa income tax purposes.**
YES	**NO**	**My business is an active corporation with the Iowa Secretary of State & has paid all fees required by the Secretary of State, has filed its most recent biennial report, & has not filed articles of dissolution.**
YES	**NO**	**My business is a corporation whose articles of incorporation are filed in a state other than Iowa, the corporation has received a certificate of authority from the Iowa secretary of state, has filed its most recent biennial report with the secretary of state, & has neither received a certificate of withdrawal from the secretary of state nor had its authority revoked.**
YES	**NO**	**My business is a limited liability partnership which has filed a statement of qualification in this state & the statement has not been canceled.**
YES	**NO**	**My business is a limited liability partnership which has filed a statement of qualification in a state other than Iowa, has filed a statement of foreign qualification in Iowa & a statement of cancellation has not been filed.**
YES	**NO**	**My business is a limited partnership or limited liability partnership which has filed a certificate of limited partnership in this state, & has not filed a statement of termination.**
YES	**NO**	**My business is a limited partnership or a limited liability limited partnership whose certificate of limited partnership is filed in a state other than Iowa, the limited partnership or limited liability limited partnership has received notification from the Iowa secretary of state that the application for certificate of authority has been approved & no notice of cancellation has been filed by the limited partnership or the limited liability limited partnership.**

YES	**NO**	**My business is a limited liability company whose certificate of organization is filed in Iowa & has not filed a statement of termination.**
YES	**NO**	**My business is a limited liability company whose certificate of organization is filed in a state other than Iowa, has received a certificate of authority to transact business in Iowa & the certificate has not been revoked or canceled.**

END OF SECTION

SECTION 00 4100.03

NON-COLLUSION AFFIDAVIT

The undersigned bidder or agent, being duly sworn on oath, says that he/she has not, nor has any other member, representative, or agent of the firm, company, corporation or partnership represented by him, entered into any combination, collusion or agreement with any person relative to the price to be bid by anyone at such letting nor to prevent any person from bidding nor to include anyone to refrain from bidding, and that this bid is made without reference to any other bid and without any agreement, understanding or combination with any other person in reference to such bidding.

He/She further says that no person or persons, firms, or corporation has, have or will receive directly or indirectly, any rebate, fee gift, commission or thing of value on account of such sale.

OATH AND AFFIRMATION

I HEREBY AFFIRM UNDER THE PENALTIES FOR PERJURY THAT THE FACTS AND INFORMATION CONTAINED IN THE FOREGOING BID FOR PUBLIC WORKS ARE TRUE AND CORRECT.

Dated this _____ day of _____, _____.

Name of organization: _____

Title of person signing: _____

Signature: _____

ACKNOWLEDGEMENT

STATE OF _____)

COUNTY OF _____)

Before me, a Notary Public, personally appeared the above named and swore that the statements contained in the foregoing document are true and correct.

SUBSCRIBED AND SWORN TO ME THIS _____ DAY OF _____,

Notary Public Signature: _____

My Commission Expires: _____

END OF SECTION

SECTION 00 4100

BID FORM

PROJECT: JCC - CELEBRATION BARN RENOVATION

BID TO:	JOHNSON COUNTY CONSERVATION
	2048 HIGHWAY 6 NW, OXFORD, IA 52322
DELIVER BID TO:	FW KENT PARK - CONSERVATION HEADQUARTERS AND MAINTENANCE FACILITY
	2048 HIGHWAY 6 NW, OXFORD, IA 52322

SUBMITTED BY: _____

(BIDDER TO ENTER NAME AND ADDRESS).

BIDDER'S FULL NAME _____

ADDRESS _____

CITY, STATE, ZIP_____

BIDDER EMAIL ADDRESS _____

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.

1. 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.

2. The undersigned Bidder submits, herewith, bid security in accordance with the terms set forth in the Advertisement for Bids and Supplementary Instructions to Bidders.

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

DATE		NUMBER

4. 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.

5. 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.

6. BIDDER will complete the Work in accordance with the Contract Documents per Section 00 4201 Schedule of Bid Prices

Lump Sum Bid Price

_____ $ _____
(use words)

Alternate Bid No. 01: Dry Fire Suppression System - mark out one: (add)(deduct)

_____ ($_____.____)
(use words)

7. BIDDER agrees that the Work will be completed in accordance with the project schedule in the Advertisement for Bids.

8. 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.

9. 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.

10. The following documents are attached to and made a condition of this Bid:

a. Required Bid Security in the amount of _____ and in the form of _____. SUBMITTED IN A SEPARATE ENVELOPE.

b. 00 4100.01 - Bidder Status Form

c. 00 4100.02 - Authorization to Transact Business Worksheet

d. 00 4100.03- Non-Collusion Affidavit.

11. This Bid submitted on _____, 20____.

12. State Contractor License No._____.

13. 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.

14. 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/ENGINEER NO LATER THAN 3:00 PM ON FEBRUARY 21, 2025.

PROJECT: JCC - Celebration Barn Renovation

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.

			Item No.		Description

_____

For Use by the Architect/Engineer

Substitution:	__	Approved		__	Not Approved
	__	Approved As Noted		__	Not Approved - Received too Late

By: _____ Date: _____

END OF SECTION

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 5200 - Agreement Form for the Agreement form to be executed.

B. See Section 00 7200 - General Conditions for the General Conditions.

C. See Section 00 7300 - Supplementary Conditions for the Supplementary Conditions.

D. The Agreement is based on AIA A101.

E. 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 Contract Documents.

B. Bond Forms:

1. Bid Bond Form: AIA A310.
2. Performance and Payment Bond Form: AIA A312.

C. Post-Award Certificates and Other Forms:

1. Application for Payment Forms: AIA G702 with AIA G703 (for Contractors).

D. Clarification and Modification Forms:

1. Request for Interpretation Form: Contractor-created form (PDF).
2. Substitution Request Form (During Construction): Section 00 6325.
3. Architect's Supplemental Instructions Form: Architect-created form (PDF).
4. Construction Change Directive Form: AIA G714.
5. Proposal Request Form: Architect-created form (PDF).
6. Change Order Request Form: Contractor-created form (PDF).
7. Change Order Form: AIA G701.

E. Closeout Forms:

1. Certificate of Substantial Completion Form: AIA G704.
2. Affidavit of Payment of Debts and Claims Form: AIA G706.
3. Affidavit of Release of Liens Form: AIA G706A.
4. Consent of Surety to Final Payment Form: AIA G707.

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 A310 - Bid Bond; 2010.

D. AIA A312 - Performance Bond and Payment Bond; 2010.

E. AIA G701 - Change Order; 2017.

F. AIA G702 - Application and Certificate for Payment; 1992.

G. AIA G703 - Continuation Sheet; 1992.

H. AIA G704 - Certificate of Substantial Completion; 2017.

I. AIA G709 - Proposal Request; 2018.

J. AIA G710 - Architect's Supplemental Instructions; 2017.

K. AIA G714 - Construction Change Directive; 2017.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 00 5200
AGREEMENT FORM

CHECKLIST:

PART 1 GENERAL

2.1 FORM OF AGREEMENT

A. The Form of Agreement, AIA A101-2017 “Standard Form of Agreement Between Owner and Contractor,” to be executed is attached following this section.

2.2 RELATED REQUIREMENTS

A. Section 00 7200 - General Conditions.

B. Section 00 7300 - Supplementary Conditions.

C. Section 01 4216 - Definitions.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

AIA® Document A101® – 2017

Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum

AGREEMENT made as of the Twenty-first day of January in the year Two Thousand Twenty-Five
(In words, indicate day, month and year.)

BETWEEN the Owner:
(Name, legal status, address and other information)

Johnson County Conservation Board
FW Kent Park2048 US-6 NW
Oxford, IA 52322
319-456-2315

and the Contractor:
(Name, legal status, address and other information)

for the following Project:
(Name, location and detailed description)

JCCB - Celebration Barn
4045 245th Street NE
Solon, IA 52333
Interior renovations to the existing Celebration Barn, including complete catering prep kitchen remodel including equipment, interior demolition, plumbing, electrical, and electrical service, mechanical and architectural finishes. Minor improvements to the exterior are included as needed including electrical service replacement.

The Architect:
(Name, legal status, address and other information)

Shive-Hattery
4125 Westown Parkway Suite 100
West Des Moines, IA 50266
515-223-8104

The Owner and Contractor agree as follows.

ADDITIONS AND DELETIONS: The author of this document may have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

The parties should complete A101®–2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement. AIA Document A201®–2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

ELECTRONIC COPYING of any portion of this AIA® Document to another electronic file is prohibited and constitutes a violation of copyright laws as set forth in the footer of this document.

TABLE OF ARTICLES

1 THE CONTRACT DOCUMENTS

2 THE WORK OF THIS CONTRACT

3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

4 CONTRACT SUM

5 PAYMENTS

6 DISPUTE RESOLUTION

7 TERMINATION OR SUSPENSION

8 MISCELLANEOUS PROVISIONS

9 ENUMERATION OF CONTRACT DOCUMENTS

EXHIBIT A INSURANCE AND BONDS

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary, and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be:
(Check one of the following boxes.)

[ ] The date of this Agreement.

[ ] A date set forth in a notice to proceed issued by the Owner.

[X] Established as follows:
(Insert a date or a means to determine the date of commencement of the Work.)

March 2025

If a date of commencement of the Work is not selected, then the date of commencement shall be the date of this Agreement.

§ 3.2 The Contract Time shall be measured from the date of commencement of the Work.

§ 3.3 Substantial Completion

§ 3.3.1 Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion of the entire Work:
(Check one of the following boxes and complete the necessary information.)

[ ] Not later than ( ) calendar days from the date of commencement of the Work.

[X] By the following date: June 16, 2025
The project must reach final completion by June 30, 2025.

§ 3.3.2 Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work are to be completed prior to Substantial Completion of the entire Work, the Contractor shall achieve Substantial Completion of such portions by the following dates:

Portion of Work	Substantial Completion Date
N/A	

§ 3.3.3 If the Contractor fails to achieve Substantial Completion as provided in this Section 3.3, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be ($), subject to additions and deductions as provided in the Contract Documents.

§ 4.2 Alternates

§ 4.2.1 Alternates, if any, included in the Contract Sum:

Item	Price

§ 4.2.2 Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.
(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)

Item	Price	Conditions for Acceptance

§ 4.3 Allowances, if any, included in the Contract Sum:
(Identify each allowance.)

Item	Price

§ 4.4 Unit prices, if any:
(Identify the item and state the unit price and quantity limitations, if any, to which the unit price will be applicable.)

Item	Units and Limitations	Price per Unit ($0.00)

§ 4.5 Liquidated damages, if any:
(Insert terms and conditions for liquidated damages, if any.)

Time is of the essence on this contract. Contractor and Owner recognize that Owner will suffer financial and other losses if the Work is not completed within the time specified in section 3.3.1 above, plus extensions thereof allowed in accordance with the Contract. The parties also recognize the delays, expense, and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by the Owner if the Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as penalty):
.1 Substantial Completion: Contractor shall pay Owner five hundred dollars ($500.00) for each day that expires after the time (as duly adjusted pursuant to the Contract) specified in section 3.3.1 above for Substantial Completion until the Work is substantially complete.
.2 Completion of Remaining Work: After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Tim (as duly adjusted pursuant to the Contract) for completion and readiness for final payment, Contractor shall pay the Owner five hundred ($500.00) for each day that expires after such time until the Work is completed and ready for final payment.

3. Liquidated damages for failing to timely attain Substantial Completion and Final Completion are not additive and will not be imposed concurrently.
4. After Contractor achieves Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times, Contractor shall reimburse Owner for the actual costs reasonably incurred by Owner for engineering, construction observation, inspection, and administrative services needed after the time specified in section 3.3.1 for Work to be completed and ready for final payment (as duly adjusted pursuant to the Contract), until the Work is completed and ready for final payment.

§ 4.6 Other:
(Insert provisions for bonus or other incentives, if any, that might result in a change to the Contract Sum.)

N/A

ARTICLE 5 PAYMENTS

§ 5.1 Progress Payments

§ 5.1.1 Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

§ 5.1.2 The period covered by each Application for Payment shall be one calendar month ending on the last day of the month~~, or as follows:~~

§ 5.1.3 Provided that an Application for Payment is received by the Architect not later than the Second Tuesday ~~day~~ of a month, the Owner shall make payment of the amount certified to the Contractor not later than the last day of the same month the application was received. If an Application for Payment is received by the Architect after the application date fixed above, payment of the amount certified shall be made by the Owner not later than Sixty (60) days after the Architect receives the Application for Payment.
(Federal, state or local laws may require payment within a certain period of time.)

§ 5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Architect may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.5 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.6 In accordance with AIA Document A201™–2017, General Conditions of the Contract for Construction, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

§ 5.1.6.1 The amount of each progress payment shall first include:

.1 That portion of the Contract Sum properly allocable to completed Work;
.2 That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and
.3 That portion of Construction Change Directives that the Architect determines, in the Architect's professional judgment, to be reasonably justified.

§ 5.1.6.2 The amount of each progress payment shall then be reduced by:

.1 The aggregate of any amounts previously paid by the Owner;
.2 The amount, if any, for Work that remains uncorrected and for which the Architect has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document A201–2017;
.3 Any amount for which the Contractor does not intend to pay a Subcontractor or material supplier, unless the Work has been performed by others the Contractor intends to pay;
.4 For Work performed or defects discovered since the last payment application, any amount for which the Architect may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in

Article 9 of AIA Document A201–2017; and

.5 Retainage withheld pursuant to Section 5.1.7.

§ 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due:
(Insert a percentage or amount to be withheld as retainage from each Application for Payment. The amount of retainage may be limited by governing law.)

Five percent (5%)

§ 5.1.7.1.1 The following items are not subject to retainage:
(Insert any items not subject to the withholding of retainage, such as general conditions, insurance, etc.)

N/A

§ 5.1.7.2 Reduction or limitation of retainage, if any, shall be as follows:
(If the retainage established in Section 5.1.7.1 is to be modified prior to Substantial Completion of the entire Work, including modifications for Substantial Completion of portions of the Work as provided in Section 3.3.2, insert provisions for such modifications.)

Retainage to be reduced in accordance with the Supplementary Conditions and the laws of the State of Iowa as applicable.

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, upon Substantial Completion of the Work, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted at Substantial Completion shall not include retainage as follows:
(Insert any other conditions for release of retainage upon Substantial Completion.)

N/A

§ 5.1.8 If final completion of the Work is materially delayed through no fault of the Contractor, the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A201–2017.

§ 5.1.9 Except with the Owner's prior approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

§ 5.2 Final Payment

§ 5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

.1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Article 12 of AIA Document A201–2017, and to satisfy other requirements, if any, which extend beyond final payment; and

.2 a final Certificate for Payment has been issued by the Architect.

§ 5.2.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the Architect's final Certificate for Payment, or as follows:

The Owner's final payment to the Contractor shall be made no earlier than thrity-one (31) days following approval and final acceptance of the Project by Johnson County Conservation upon receipt and review of the Architect-provided documentation. Final payment may be contingent upon receipt of all Chapter 573 claim releases (the equivalent of lien waivers on public improvement projects in Iowa) and other required closeout documents and shall be subject to the condition of and shall be paid in accordance with the provisions of Iowa Code Chapter 573 and Iowa Code Chapter 26.

§ 5.3 Interest

Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.
(Insert rate of interest agreed upon, if any.)

A rate quial to the rate specified by rule pursuant to Iowa Code Section 74A.2 or Iowa Code Section 573.14, whichever is less.
%

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 Initial Decision Maker

The Architect will serve as the Initial Decision Maker pursuant to Article 15 of AIA Document A201–2017, unless the parties appoint below another individual, not a party to this Agreement, to serve as the Initial Decision Maker.
~~*(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)*~~

§ 6.2 Binding Dispute Resolution

For any Claim subject to, but not resolved by, mediation pursuant to Article 15 of AIA Document A201–2017, the method of binding dispute resolution shall be as follows:
(Check the appropriate box.)

[ ] Arbitration pursuant to Section 15.4 of AIA Document A201–2017

[X] Litigation in a court of competent jurisdiction

[ ] Other *(Specify)*

If the Owner and Contractor do not select a method of binding dispute resolution, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, Claims will be resolved by litigation in a court of competent jurisdiction.

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2017.

§ 7.1.1 If the Contract is terminated for the Owner's convenience in accordance with Article 14 of AIA Document A201–2017, then the Owner shall pay the Contractor a termination fee as follows:
(Insert the amount of, or method for determining, the fee, if any, payable to the Contractor following a termination for the Owner's convenience.)

N/A

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2017.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2017 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 The Owner's representative:
(Name, address, email address, and other information)

Brad Freidhof
FW Kent Park2048 US-6 NW
Oxford, IA 52322
319-645-2115
bfreidhof@johnsoncountyiowa.gov

§ 8.3 The Contractor's representative:
(Name, address, email address, and other information)

§ 8.4 Neither the Owner's nor the Contractor's representative shall be changed without ten days' prior notice to the other party.

§ 8.5 Insurance and Bonds

§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum, Exhibit A, Insurance and Bonds, and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in AIA Document A101™–2017 Exhibit A, and elsewhere in the Contract Documents.

§ 8.6 Notice in electronic format, pursuant to Article 1 of AIA Document A201–2017, may be given in accordance with a building information modeling exhibit, if completed, or as otherwise set forth below:
(If other than in accordance with a building information modeling exhibit, insert requirements for delivering notice in electronic format such as name, title, and email address of the recipient and whether and how the system will be required to generate a read receipt for the transmission.)

N/A

§ 8.7 Other provisions:

Section 00 5350 Insurance Requirement
Section 00 7300 Supplementary Conditions

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

.1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor
.2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds
.3 AIA Document A201™–2017, General Conditions of the Contract for Construction
.4 Building information modeling exhibit, dated as indicated below:
(Insert the date of the building information modeling exhibit incorporated into this Agreement.)

.5 Drawings

Number	Title	Date

.6 Specifications

Section	Title	Date	Pages

.7 Addenda, if any:

Number	Date	Pages

Portions of Addenda relating to bidding or proposal requirements are not part of the Contract Documents unless the bidding or proposal requirements are also enumerated in this Article 9.

.8 Other Exhibits:
(Check all boxes that apply and include appropriate information identifying the exhibit where required.)

[ ] AIA Document E204™–2017, Sustainable Projects Exhibit, dated as indicated below:
(Insert the date of the E204-2017 incorporated into this Agreement.)

[ ] The Sustainability Plan:

Title	Date	Pages

[X] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages

.9 Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201™–2017 provides that the advertisement or invitation to bid, Instructions to Bidders, sample forms, the Contractor's bid or proposal, portions of Addenda relating to bidding or proposal requirements, and other information furnished by the Owner in anticipation of receiving bids or proposals, are not part of the Contract Documents unless enumerated in this Agreement. Any such documents should be listed here only if intended to be part of the Contract Documents.)

This Agreement entered into as of the day and year first written above.

OWNER *(Signature)*	**CONTRACTOR** *(Signature)*
(Printed name and title)	*(Printed name and title)*

SECTION 00 5350
INSURANCE REQUIREMENTS

SECTION I

1.1 BASIC INSURANCE REQUIREMENTS

A. Contractor, at its own expense, shall procure and maintain during the life of this Contract, the following insurance so as to cover all risk which shall arise directly or indirectly from Contractor's obligations and activities.

B. The Contractor is required to purchase and maintain insurance coverage to protect the Contractor and Johnson County throughout the duration of this Contract as enumerated above in the minimum limits above written and the requirement shall be a part of the Contract. Failure on the part of the Contractor to maintain this insurance in full effect will be treated as a failure on the part of the Contractor to comply with these requirements and be considered sufficient cause to suspend the work, withhold payment(s), and/or be disqualified in the future.

1.2 GENERAL LIABILITY INSURANCE

A. Contractor shall carry the most recently approved ISO Commercial General Liability Insurance policy, or its equivalent, written on an occurrence-basis, with limits not less than $1,000,000 per occurrence / $2,000,000 general aggregate for Bodily Injury and Property Damage, including the following coverages:

1. Premises
2. Contractual Liability
3. Products and Completed Operations Coverage
4. Broad Form Property Damage Liability, including Explosion, Collapse, and Underground coverages; an elimination of the exclusions with respect to property under the care, custody or control of Contractor (or, in lieu of elimination of the exclusion, Contractor may provide Builder’s Risk or Installation Floater coverage for property under the care, custody, or control of Contractor); and Independent Contractor Coverage.
5. Personal Injury Liability

1.3 AUTOMOBILE LIABILITY INSURANCE

A. Automobile liability insurance with a combined single limit of at least $1,000,000 per occurrence for bodily injury and property damage. Coverage shall include all owned, hired, and non-owned motor vehicles used in the performance of this contract by the Contractor or its employees.

1.4 WORKERS COMPENSATION AND EMPLOYERS’ LIABILITY INSURANCE

A. Meet the relevant Workers Compensation Statutes.

1.5 A COPY OF ONE (1) ENDORSEMENT IS REQUIRED:

A. Cancellation and Material Changes Endorsement

1. Thirty (30) days Advance Written Notice of Cancellation, Non-Renewal, Reduction in insurance coverage and/or limits and ten (10) days written notice of non-payment of premium shall be sent to:

Brad Freidhof, Interim Director
2048 Hwy 6 NW
Oxford, IA 52322
Email: BFreidhof@JohnsonCountyIowa.gov
Please note that JCCB does accept a signed letter on the agent's letterhead, from the insured's insurance agent, confirming that the agent will provide notice as indicated above.

1.6 ADDITIONAL INSURED ENDORSEMENT

A. Johnson County, Iowa, including all its elected and appointed officials, all its employees and volunteers, all its boards, commissions and/or authorities and their board members, employees, and volunteers, are included as Additional Insured with respect to liability arising out the Insured's work and/or services performed for Johnson County, Iowa. This coverage shall be primary to the Additional Insured, and not contributing with any other insurance or similar protection available to the Additional Insureds, whether available coverage be primary, contributing or excess. JOHNSON COUNTY intends to be an Additional Insured with coverage being primary and not contributing with any other insurance or similar protection available to JOHNSON COUNTY whether any other coverage is primary, contributing or excess. JOHNSON COUNTY may require an endorsement preserving JOHNSON COUNTY'S governmental immunities under such coverage. See below.

1. JOHNSON COUNTY, IOWA
2. GOVERNMENTAL IMMUNITIES ENDORSEMENT
3. (for use when including the County as an Additional Insured)
4. Nonwaiver of Government Immunity. The insurance carrier expressly agrees and states that the purchase of this policy and the including of Johnson County, Iowa as Additional Insured does not waive any of the defenses of governmental immunity available to Johnson County, Iowa under Code of Iowa Section 670.4 as it now exists and as it may be amended from time to time.
5. Claims Coverage. The insurance carrier further agrees that this policy of insurance shall cover only those claims not subject to the defense of governmental immunity under the Code of Iowa Section 670.4 as it now exists and as may be amended from time to time.
6. Assertion of Government Immunity. Johnson County, Iowa shall be responsible for asserting any defense of governmental immunity, and may do so at any time and shall do so upon the timely written request of the insurance carrier. Nothing contained in this endorsement shall prevent the carrier from asserting the defense of governmental immunity on behalf of Johnson County, Iowa.
7. Non-Denial of Coverage. The insurance carrier shall not deny coverage under this policy and the insurance carrier shall not deny any of the rights and benefits accruing to Johnson County, Iowa under this policy for reasons of governmental immunity unless and until a court of competent jurisdiction has ruled in favor of the defense(s) of governmental immunity asserted by Johnson County, Iowa.
8. No Other Change in Policy. The insurance carrier and Johnson County, Iowa agree that the above preservation of governmental immunities shall not otherwise change or alter the coverage available under the policy."

1.7 BONDING REQUIREMENTS

A. In addition to bid security provided for elsewhere in this Agreement, Contractor shall procure and furnish:

1. A performance bond on the part of the Contractor for 100 percent (100%) of the contract price, satisfactory to the Owner, to secure fulfillment of all the Contractor's obligations under this contract.
2. A payment bond on the part of the Contractor for 100 percent (100%) of the contract price, satisfactory to the Owner, to assure payment as required by law of all persons supplying labor and material in the execution of the work provided for in the contract.
3. Contractor may use the most current form of American Institute of Architects Document A312, Performance Bond and Labor and Material Payment Bond, fully executed and for the applicable contract amounts, to satisfy 1. and 2., above.

SECTION II

2.1 CONDITIONS OF CONTRACT

A. The Contractor is required to purchase and maintain insurance coverage to protect the Contractor and JCCB throughout the duration of this Contract as enumerated above in the minimum limits above written and the requirement shall be a part of the Contract. Failure on the part of the Contractor to maintain this insurance in full effect will be treated as a failure on the part of the Contractor to comply with these requirements and be considered sufficient cause to suspend the work, withhold payment(s), and/or be disqualified in the future.

B. The insurance policies shall be issued by insurers authorized to do business in the State of Iowa and currently having an A.M. Best Rating of "B+" or better. All policies shall be occurrence form. If Professional Liability coverage is written on a claim made policy form, the certificate of insurance must clearly state coverage is claims made and coverage must remain in effect for at least two years after final payment with the Contractor continuing to furnish JCCB certificates of insurance.

C. The Contractor shall be responsible for deductibles and self-insured retentions in the Contractor's insurance policies. Insofar as there is a deductible for any builder's risk insurance policies or coverage obtained by Owner, the Contractor shall be responsible for any losses or costs associated with such deductible(s).

D. The Contractor is required to give JCCB notice of any change in coverage, specifically, any reduction in coverage and cancellation of coverage no less than thirty (30) days prior to the effective date of any non-renewal or cancellation of any policies required by the Contract.

END OF SECTION

SECTION 00 6325

SUBSTITUTION REQUEST FORM - DURING CONSTRUCTION

TO: _____

PROJECT: JCC - Celebration Barn Renovation

OWNER: Johnson County Conservation

A/E: Shive-Hattery, Inc.

BID DATE: _____

We hereby submit for your consideration the following product instead of the specified item for the above project:

DRAWING NO.: _____ DRAWING NAME: _____

SPEC SECT.	SPEC NAME	PARAGRAPH	SPECIFIED ITEM
_____	_____	_____	_____

Proposed Substitution:

_____

_____

_____

_____

Attach complete information on changes to Drawings and/or Specifications which proposed substitution will require for its proper installation.

Submit, with request, all necessary samples and substantiating data to prove equal quality and performance to that which is specified. Clearly mark manufacturer's literature to indicate equality in performance.

CERTIFICATION OF EQUAL PERFORMANCE AND ASSUMPTION OF LIABILITY FOR EQUAL PERFORMANCE

The undersigned states that the function, appearance and quality are equivalent or superior to the specified item.

Submitted by:

Signature: _____

Title: _____

Firm: _____

Address: _____

Telephone: _____ Date: _____

Signature shall be by person having authority to legally bind the firm to the above terms. Failure to provide legally binding signature will result in retraction of approval.

FOR USE BY Architect/Engineer:

__ Accepted __ Accepted as Noted __ Not Accepted __ Received Too Late

Date: _____

FILL IN BLANKS BELOW

Does the substitution affect dimensions shown on Drawings? Yes No
If Yes, clearly indicate changes:

_____
_____
_____

Will the undersigned pay for changes to the building design, including engineering and detailing costs caused by the requested substitution? Yes No
If No, fully explain:

_____
_____
_____

What effect does substitution have on other Contracts or other trades?

_____
_____
_____

What effect does substitution have on construction schedule?

_____
_____
_____

Manufacturer's warranties of the proposed and specified items
are: _____ Same _____Different
(Explain on Attachment)
Reason for Request:

_____
_____
_____

Itemized comparison of specified item(s) with the proposed substitution. List significant variations:

_____
_____
_____

Accurate cost data comparing proposed substitution with product specified:

_____
_____

Designation of maintenance services and sources:

_____
_____

(ATTACH ADDITIONAL SHEETS IF REQUIRED)

END OF SECTION

SECTION 00 7100
CONTRACTING DEFINITIONS

PART 1 GENERAL

1.1 APPLICABILITY: THESE DEFINITIONS ARE INTEGRAL TO THE AGREEMENT.

1.2 DEFINITIONS - DESIGN-BUILD DOCUMENTS

A. Contract Documents: As defined in the Conditions of the Contract and as follows:

1. At the time of execution of the Agreement, Contract Documents consist of the following:

a. The Agreement and Conditions of the Contract, and other documents listed on the Table of Contents under the heading Contracting Requirements.

2. From time to time after execution of the Agreement, upon approval by the Owner, the following types of documents will be incorporated into Contract Documents:

a. Drawings and other documents documenting the design.

b. Construction drawings and specifications detailing the execution of the design.

B. Project Program: The Owner's requirements for size, arrangement, organization, and location of functional spaces, description of space functions, identification of fittings, equipment, and furnishings, description of the physical and environmental requirements for each space, together with a description of the image, goals, or "mission" of the project.

1.3 DEFINITIONS - TIME PERIODS AND MILESTONE DATES

A. Preliminary Design: The time period during which the design criteria are finalized and preliminary drawings and written descriptions are prepared to illustrate the proposed design of the work or a portion of the work to the Owner, as described in the Conditions of the Contract.

B. Design Development: The time period during which the form, arrangement, size, and materials of the work or a portion of the work are determined as described in the Conditions of the Contract.

C. Construction Documents: The time period during which process working drawings, specifications, and other documents describing the work or a portion of the work are prepared in sufficient detail to allow accurate and complete construction.

D. Construction: The time period from the beginning of work on the project site until final payment as defined by the Conditions of the Contract.

E. Substantial Completion: The date as defined in the Conditions of the Contract. Date of Substantial Completion is the due date for the following:

1. Design-Builder's complete punchlist of items to be completed.

2. Owner's complete punchlist of items to be completed.

3. Compliance with requirements of governing authorities, for submittals, inspections, and permits.

4. Compliance with Owner's requirements for access to areas occupied by the Owner.

F. Closeout: The time period during which all details of both construction and commissioning are completed.

1. The Closeout period is the time from Date of Substantial Completion until final payment, both as defined by the Conditions of the Contract.
2. Before and during the Closeout period, the Owner will ascertain whether the completed project complies with Contract Documents.

G. Occupancy: The time period during which the project is occupied for its intended purpose.

1. The Occupancy period begins at Date of Substantial Completion, as defined by the Conditions of the Contract.

H. Correction Period: The time period defined by the Conditions of the Contract.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 00 7200

GENERAL CONDITIONS

FORM OF GENERAL CONDITIONS

AIA A201-2017 "General Conditions of the Contract for Construction" is the General Conditions between the Owner and the Contractor and is hereby made a part of these documents to the same extent as if bound herein. The document can be purchased from the American Institute of Architects state office as follows:

AIA Iowa
400 Locust Street, Suite 100
Des Moines, IA 50309
Phone: 515-244-7502
Fax: 515-244-5347
www.aiaiowa.org

RELATED REQUIREMENTS

Section 00 7300 - Supplementary Conditions.
Section 01 4216 - Definitions.

SECTION 00 7300
SUPPLEMENTARY CONDITIONS

ARTICLE 1: GENERAL PROVISIONS

No Supplements

ARTICLE 2: OWNER

2.1 GENERAL

Add the following Clause 2.1.1.1 to Section 2.1.1:

2.1.1.1 The Owner is:

Name:	Johnson County Conservation
Address:	2048 Highway 6 NW, Oxford, IA 52322
Telephone:	319-645-2315

Add the following Clause 2.1.1.2 to Section 2.1.1:

2.1.1.2 The Owner's Authorized contract Representative is:

Name:	Brad Freidhof
Title:	Interim Director
Address:	2048 Highway 6 NW, Oxford, IA 52322
Telephone:	319-645-2315
Fax:	N/A
Email:	bfreidhof@johnsoncountyiowa.gov

2.3 INFORMATION AND SERVICES REQUIRED OF THE OWNER

Delete Section 2.3.2 and substitute the following Section 2.3.2:

2.3.2 The "Architect" is defined in this Contract as the Engineer or Architect lawfully licensed to practice architecture or engineering or an entity licensed to lawfully practice architecture or engineering in the jurisdiction where the project is located and identified as such in this Contract and as is referred to throughout the Contract documents as if singular in number. The term "Engineer," "Architect/Engineer," "Engineer/Architect," "Architect's authorized representative," "Engineer's authorized representative," or "Architect/Engineer's authorized representative" shall mean "Architect" as defined in this Section.

Delete Section 2.3.6 and substitute the following Section 2.3.6:

2.3.6 The Owner will furnish the Contractor copies of the Contract Documents returned to Rapids Reproductions for use in execution of the work. The Contractor may purchase additional copies at the cost of reproduction, postage, and handling.

ARTICLE 3: CONTRACTOR

3.2 REVIEW OF CONTRACT DOCUMENTS & FIELD CONDITIONS BY CONTRACTOR

Add the following sentence to the end of 3.2.2:

3.2.2 The Contractor also represents that all Contract Documents for the Project have been examined, including those intended for work of trades not normally performed by the Contractor's own forces, and that it has become thoroughly familiar with all conditions which may pertain to or affect the Work under the Contract.

Add the following Section 3.2.5 to Section 3.2:

3.2.5 The Owner is entitled to reimbursement from the Contractor for amounts paid to the Architect for evaluating and responding to the Contractor's Requests For Information (RFI) that are not prepared in accordance with the Contract Documents or where the requested information is available to the Contractor from a careful study and comparison of the Contract Documents, field conditions, other Owner-provided information, Contractor-prepared coordination drawings, or prior Project correspondence or documentation.

3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

Add the following Sections 3.3.4 and 3.3.5:

3.3.4 The Owner reserves the right to retain ownership to any materials or equipment that is part of the existing facility. If material or equipment is to be removed from the site, the Contractor shall detach such items and before removing from site, obtain permission from the Owner, or his designee, to do so. All items not retained by Owner shall be removed in a proper manner by the Contractor.

3.3.5 The Contractor shall submit to the Owner before construction begins one copy of Material Safety Data Sheets of hazardous substances to be stored on the Owner's premises or incorporated in the performance of this contract. The Contractor shall also keep Material Safety Data Sheets posted at the work site for all substances while these substances are on the Owner's premises. Hazardous substances shall be any substance which is covered by Law (Right to Know Rules).

3.4 LABOR AND MATERIALS

Add the following sentence to the end of 3.4.1:

3.4.1 Work required by the Contract Documents to be performed after working hours or work the Contractor elects to perform after hours shall be included in the Contract Sum.

Add Sections 3.4.4 through 3.4.8:

3.4.4 After the Contract has been executed, the Owner and the Architect will consider a formal request for the substitution of products in place of those specified only under the conditions set forth in the Specifications, Division 01, General Requirements.

3.4.5 By making requests for substitutions based on Subparagraph 3.4.4 above, the Contractor:

1. Represents that the Contractor has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to that specified;

2. Represents that the Contractor will provide the same warranty for the substitution that the Contractor would for the specified product;

3. Certifies that the cost data presented in the substitution request is complete and includes all related costs under this Contract except the Architect/Engineer's review and/or redesign costs, and waives all claims for additional costs related to the substitution which subsequently become apparent; and

4. Will coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects at the Contractor's expense.

3.4.6 The Owner shall be entitled to reimbursement from the Contractor for amounts paid to the Architect for reviewing the Contractor's proposed substitutions and making agreed-upon changes in the Drawings and Specifications resulting from such substitutions.

3.4.7 The Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect or Architect's Consultants to evaluate the Contractor's proposed substitutions and to make agreed-upon changes in the Contract Documents made necessary by the Owner's acceptance of such substitutions.

3.4.8 The Contractor, and its subcontractors, shall conform to local labor laws of the State in which the project resides. Prior to starting Work, the Contractor shall become familiar with local labor and trade conditions, skilled and unskilled, and shall conform to the local conditions. The Contractor shall consider the availability of labor in the area and import labor as may be required, at the Contractor's expense, to meet the Schedule for the Work.

3.6 TAXES

Delete the language in Section 3.6 and substitute the following Sections:

3.6.1 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 Iowa. The Contractor shall continue to pay sales tax on items that do not become a part of the Project. For details, refer to .

3.6.2 The Owner as a designated exempt entity will complete an online application to register this Project with the Iowa Department of Revenue and Finance. The Owner will distribute Tax Exemption Certificates and Authorization Letters to the Contractor and all Subcontractors who have been identified at, or before filing of the Performance Bond.

3.6.3 On or before the time the Performance Bond is filed, the Contractor shall provide a listing to the Owner identifying all Subcontractors. Contractor and Subcontractors shall make copies of the Tax Exemption Certificate and provide a copy to each supplier providing construction material. This Certificate will allow the Contractor and Subcontractors to purchase qualified building materials free from sales tax for the Project. The Tax Exemption Certificate and Authorization Letter have been developed exclusively for this purpose and are applicable only for this specific Project.

3.6.4 If the online registration is not available at the time The Contract is approved by the Owner, the Owner will notify the Contractor, in writing, and the cost of sales tax on all construction materials used for the Project will be added to the Contract Sum. The Contractor shall then submit Form 35-002 to the Owner for Iowa sales/use tax paid.

3.6.5 Payment will be made in accordance with the payment provisions set out in these specifications and the Advertisement for Bids and Notice of Public Hearing. Notwithstanding anything in these specifications and the Advertisement for Bides and Notice of Public Hearing to the contrary, no Final Payment shall be released until Form 35-002 has been filed with the Owner, where applicable, and all lien waivers are on file.

3.6.6 Notwithstanding anything herein to the contrary, Contractor shall file with Owner forms contemplated by the Iowa Code enabling Owner to apply for a refund for any sales or use tax paid in carrying out the work.

3.7 PERMITS, FEES, NOTICES, AND COMPLIANCE WITH LAWS

Delete Section 3.7.5 and substitute the following Section 3.7.5:

3.7.5 If, in the course of the Work, the Contractor knowingly encounters and recognizes human remains, burial markers, archeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains and features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence or good faith belief of such existence of such remains or features may be made as provided in Article 15.

Add Clauses 3.7.5.1 through 3.7.5.3 to Section 3.7.5:

3.7.5.1 Upon securing building permits, any plan reviews and fees which may be required by the State or Local Jurisdiction Having Authority in which the project resides, such as Fire Alarm and Automatic Sprinkler System, shall be borne by the Contractor.

3.7.5.2 The Contractor is responsible for scheduling inspections related to the performance of its Work and ensuring Work is complete for inspections. The Contractor is responsible for any costs associated with re-inspection caused by Work that is not in accordance with the requirements of the Contract Documents. In addition, the Contractor is responsible for costs associated with Architectural/Engineering services related to evaluation of the deficiencies and development of an acceptable solution.

3.7.5.3 The Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect/Engineer or Architect/Engineer's Consultants for services related to evaluation of the deficiencies and development of an acceptable solution, including agreed-upon changes in the Contract Documents.

Add the following Section 3.7.6 and associated clauses 3.7.6.1 thru 3.7.6.3:

3.7.6 The State of Iowa, its agencies, and its political subdivisions, including cities, school districts, public partnerships, and public utilities are required by Iowa Code Section 73A.21 to require a reciprocal resident bidder and resident labor force preference.

3.7.6.1 A “Resident Bidder” means a person or entity authorized to transact business in the State of Iowa and having a place of business for transacting business within the state at which it is conducting and has conducted business for at least three years prior to the date of the first advertisement for the public improvement. If another state or foreign country has a more stringent definition of a resident bidder, the more stringent definition is applicable as to bidders from that state or foreign country.

3.7.6.2 A resident bidder shall be allowed a preference as against a nonresident bidder from a state or foreign country other than Iowa if that state our foreign country gives or requires any preference to bidders from that state of foreign country, including but not limited to any preference to bidders, the imposition of any type of labor force preference, or any other form of preferential treatment to bidders or laborers from that state of foreign county. The preference allowed shall be equal to the preference given or required by the state or foreign country in which the nonresident bidder is a resident.

3.7.6.3 If the Contractor is a nonresident bidder, the Contractor is required to specify in the Agreement between the Owner and Contractor whether any preference (as described in 3.7.6.2) is in effect in the nonresident bidder’s state or country at the time of this bid and identify the source of the regulation.

3.9 SUPERINTENDENT

Delete Section 3.9.1 and substitute the following Section 3.9.1:

3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site whenever two or more subcontractors are performing the Work. The superintendent’s absence from the project site when work is being performed does not relieve the Contractor of any responsibility for correctly performing the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

Add the following Section 3.9.1.1

3.9.1.1 The Contractor shall employ an assistant to the superintendent who shall perform as coordinator for mechanical and electrical Work. The coordinator shall be knowledgeable in mechanical and electrical systems and capable of reading, interpreting, and coordinating Drawings, Specifications, and shop drawings pertaining to these systems and other systems that may affect or be affected by these systems. The coordinator shall assist the Superintendent in arranging space conditions to eliminate interferences between mechanical, electrical, plumbing, structural, architectural, fire protection, and other systems and Work and shall supervise preparation of coordination drawings documenting the spatial arrangements for such systems within restricted spaces. The coordinator shall assist in planning and expediting the proper sequence of delivery and installation of mechanical and electrical equipment, and Owner furnished items if any.

3.10 CONTRACTOR'S CONSTRUCTION AND SUBMITTAL SCHEDULE

Delete the last sentence of Section 3.10.2 so that the Section now reads:

3.10.2 The Contractor promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Architect's approval. The Architect's approval shall not be unreasonably delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals.

3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

Add the following Section 3.12.11:

3.12.11 The Architect's and its Consultants' review of Contractor's submittals will be limited to examination of an initial submittal and one (1) re-submittal. The Architect's review of additional submittals will be made only with the consent of the Owner after written notification to the Contractor and Owner by the Architect. The Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect for evaluation of such additional re-submittals.

3.13 USE OF SITE

Add the following Sections 3.13.1 and 3.13.2:

3.13.1 Contractor shall perform the Work so as to cause a minimum of inconvenience to and interruption of the Owner's operations. Any and all interruptions of the operations of the Owner necessary for the performance of the Work shall be noted in the Progress Schedule and the Contractor shall additionally give the Owner sufficient advanced written notice of such interruption as to allow the Owner to adjust operations accordingly. Contractor's failure to give the Owner timely written notice of such intentions shall place the responsibility of any resulting delays or additional costs solely with the Contractor.

3.13.2 The Contractor, any subcontractor, supplier, vendor or anyone else for whom the Contractor is responsible, shall not bring on the site any asbestos, PCB's, petroleum, hazardous waste or radioactive materials, except for proper use in performing the Work.

3.14 CUTTING AND PATCHING

Delete Section 3.14.1 and replace with the following:

3.14.1 The Contractor shall be responsible for cutting, fitting or patching required to complete the Work or to make its parts fit together properly. Contractor shall be responsible for cutting and patching not specifically indicated on the drawings, but required for completion of their Work. No structural member shall be cut unless approved by the Architect or Architect's Consultants. All areas requiring cutting, fitting, or patching shall be restored to the condition existing prior to the cutting, fitting, or patching, unless otherwise required by the Contract Documents.

ARTICLE 4: ARCHITECT

4.1 GENERAL

Add the following clause 4.1.1.1 to section 4.1.1:

4.1.1.1 The Architect is:

Name:	Shive-Hattery, Inc.
Address:	4125 Westown Pkwy, Suite 100, West Des Moines, IA 50266
Phone:	515-223-8104
Project Contact Person:	Cara Lindell
Contact Person Email:	clindell@shive-hattery.com

4.2 ADMINISTRATION OF THE CONTRACT

Add Clause 4.2.2.1 to Section 4.2.2:

4.2.2.1 The Owner is entitled to reimbursement from the Contractor for amounts paid the Architect for site visits made necessary by the fault of the Contractor or by defects and deficiencies in the Work. The Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect for such site visits.

Add the following sentence to the end of Section 4.2.13:

4.2.13 The term aesthetic effect includes, but is not limited to color, texture, profile, and relationship of masses.

ARTICLE 5: SUBCONTRACTORS

5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

Delete Section 5.2.1 and substitute with the following Section 5.2.1:

5.2.1 Unless otherwise stated in the Contract Documents, the Contractor, within seven (7) calendar days after award of the contract and prior to execution of the contract, shall notify the Owner and Architect of the persons or entities (proposed for each principal portion of the work including those who are to furnish materials or equipment fabricated to a special design). After receipt of the information the Architect may notify the contractor within seven (7) calendar days whether or not the Owner or the Architect, after due investigation, (1) has reasonable objection to any such proposed person or entity, or (2) requires additional time and/or information to complete the review. Failure of the Architect to reply within this time period shall constitute notice of no reasonable objections.

ARTICLE 6: CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

No Supplements

ARTICLE 7: CHANGES IN THE WORK

7.1 GENERAL

Add the following Section 7.1.4 and associated clauses 7.1.4.1 thru 7.1.4.9:

7.1.4 The combined overhead and profit included in the total cost to the Owner of a change in the Work shall be based on the following schedule:

7.1.4.1 For the Contractor, for Work performed by the Contractor's own forces, 15 percent of the cost.

7.1.4.2 For the Contractor, for Work performed by the Contractor's Subcontractors, 5 percent of the amount due the Subcontractors.

7.1.4.3 For each Subcontractor involved, for Work performed by that Subcontractor's own forces, 15 percent of the cost.

7.1.4.4 For each Subcontractor involved, for Work performed by the Subcontractor's Sub-subcontractors, 5 percent of the amount due the Sub-subcontractor.

7.1.4.5 The maximum allowable combined overhead and profit passed through to the Owner under any circumstances shall be a maximum of 25 percent.

7.1.4.6 Cost to which overhead and profit is to be applied shall be determined in accordance with Section 7.3.4.

7.1.4.7 In order to facilitate checking of quotations for extras or credits, all proposals, except those so minor that their property can be seen by inspection, shall be accompanied by a complete itemization of costs including labor, materials, and subcontracts. Itemize labor by trade, tasks, hour quantities and labor rates. Itemize materials by product, quantity and unit price. Where major cost items are subcontracts, they shall be itemized also. In no case will a change involving over $500 be approved without such itemization.

7.1.4.8 The Contractor represents that proposals will include all related costs prior to presentation to the Owner or Architect for consideration.

7.1.4.9 The Architect's review of the Contractor's proposals will be limited to one initial submittal and one re-submittal. The Owner is entitled to obtain reimbursement from the Contractor for amounts paid to the Architect for evaluation and response to additional re-submittals, wherein the first two submittals were not prepared in accordance with the Contract Documents.

7.2 CHANGE ORDERS

Add the following Section 7.2.2:

7.2.2 The forms used to process a Change Order will include AIA Document AIA G701, Change Order.

ARTICLE 8: TIME

8.1 DEFINITIONS

Delete Section 8.1.4 and substitute the following Section 8.1.4:

8.1.4 The term "Day" as used in the Contract Documents shall mean working day, excluding weekends and legal holidays.

8.2 PROGRESS AND COMPLETION

8.2.2 Delete the word "knowingly" in the first sentence.

8.2.3 Revise the end of the sentence after "Substantial Completion" as follows:

"...and Final Completion within the Contract Times specified."

ARTICLE 9: PAYMENTS AND COMPLETION

9.3 APPLICATION FOR PAYMENT

Delete Section 9.3.1 and substitute the following Section 9.3.1:

9.3.1 At least 30 (thirty) days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment for operations completed in accordance with the schedule of values. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers. If the Contract Documents require the Owner to retain a portion of the payments until some future time, the Applications for Payment shall clearly state the percentage and the amount to be retained.

Add the following sentence to Section 9.3.1:

9.3.1 The form of Application for Payment shall be a notarized current edition of AIA Document AIA G702, Application and Certification for Payment, supported by current edition of AIA Document AIA G703, Continuation Sheet.

9.5 DECISIONS TO WITHHOLD CERTIFICATION

Delete Section 9.5.4 in its entirety.

9.6 PROGRESS PAYMENTS

Delete Section 9.6.1 and substitute the following Section 9.6.1:

9.6.1 After the Architect has issued a Certificate for Payment and the Owner has approved the Application for Payment the Owner shall make payment in the manner provided in the contract Documents and in accordance with Iowa Code Chapters 26 and 573, latest edition.

Delete the first two sentences of Section 9.6.4 so that it reads as follows:

9.6.4 Neither the Owner nor Architect shall have an obligation to pay, or to see to the payment of money to, a Subcontractor or supplier, except as may otherwise be required by law.

9.8 SUBSTANTIAL COMPLETION

Add the following clause to Section 9.8.1:

9.8.1 Additionally all building systems are complete and operating properly, building and site elements are safe to occupy with no existing safety hazards and ADA, code, life safety requirements met. Building components are secure, doors and windows are lockable as required,security systems are fully functional, and remaining punchlist items will impose no undo hardship, obstruction, inconvenience, or sacrifice to the occupants during their completion.

Add the following Clause 9.8.3.1 to Section 9.8.3:

9.8.3.1 The Architect will perform no more than one (1) inspection to determine whether the Work or a designated portion thereof has attained Substantial Completion in accordance with the Contract Documents. The Owner is entitled to reimbursement from the Contractor for the amounts paid to the Architect for any additional inspections.

9.10 FINAL COMPLETION AND FINAL PAYMENT

Add the following Clause 9.10.1.1 to Section 9.10.1:

9.10.1.1 The Architect will perform no more than one (1) inspection to determine whether the Work or a designated portion thereof has attained Final Completion in accordance with the Contract Documents. The Owner is entitled to reimbursement from the Contractor for the amounts paid to the Architect for any additional inspections.

Delete Section 9.10.2 and subsititute the following Section:

9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect. (3) a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment and (5), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien. If such lien remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.

Add the following Section 9.10.6:

9.10.6 Final payment will be made no less than thirty (30) days after the date of acceptance of the Work by the Owner subject to the provisions of Sections 9.10.1 through 9.10.5. The following documents shall be completed by the contract completion date listed on the Form of Agreement and shall be received prior to making final payment:

1) Building Permit(s)

2) Certificate of Occupancy

3) Affidavits

4) Warranties

5) Lien Waivers

6) Record Drawings

7) Operation & Maintenance manuals

Add the following Section 9.10.7 and Clauses 9.10.7.1 thru 9.10.7.4:

9.10.7 The following clauses are in accordance with Iowa Code, Chapter 26, Section 26.13, Early Release of Retainage, and are reiterated here for reference. Other provisions of Chapter 26, Chapter 573, and other applicable Chapters of the Code also apply:

9.10.7.1 At any time after all work on the project is substantially completed, the Contractor may request the release of all or part of the retained funds owed. The request shall be accompanied by a sworn statement of the Contractor that, ten (10) calendar days prior to filing the request, notice was given as required by Section 7 (of Chapter 26) to all known subcontractors, sub-subcontractors and suppliers.

9.10.7.2 Except as provided under Section 3 (of Chapter 26), upon receipt of such request, the Owner shall release all or part of the retained funds. Retained funds that are approved as payable shall be paid at the time of the next monthly payment or within 30 days, whichever is sooner. If partial retained funds are released pursuant to a Contractor's request, no retained funds shall be subsequently held based on that portion of the work. If within 30 days of when payment becomes due the Owner does not release the retained funds due, interest shall accrue on the amount of retained funds at the rate of interest that is calculated as the prime rate plus one percent per year as of the day interest begins to accrue until the amount is paid.

9.10.7.3 If labor and/or materials are yet to be provided at the time the request for the release of the retained funds is made, an amount equal to 200% of the value of the labor and/or materials yet to be provided, as determined by the Owner, may be withheld until such labor and/or materials are provided.

9.10.7.4 An itemization of the labor and/or materials yet to be provided, or the reason that the request of retained funds is denied, shall be provided to the Contractor within 30 calendar days of the receipt for release of retained funds.

ARTICLE 10: PROTECTION OF PERSONS AND PROPERTY

10.2 SAFETY OF PERSONS AND PROPERTY

Delete Section 10.2.2 and substitute the following Section 10.2.2:

10.2.2 The Contractor shall give notices and comply with applicable laws, ordinances, regulations and lawful orders of public authorities bearing safety of persons or property or their protection from damage, injury or loss. This requirement also includes compliance with Iowa's Smoke Free Air Act and Iowa's Sex Offender law which no longer allows registered sex offenders to be on school property without the school's permission. Refer to the Acknowledgment and Certification document 00 7300.01 that all Contractors, Subcontractors, and Vendors must sign.

Delete Section 10.2.4 and substitute the following Section 10.2.4:

10.2.4 When use, handling, and/or storage of explosives or other hazardous materials or equipment or unusual methods is necessary for execution of the work, the Contractor shall give the Owner reasonable advance notice and shall exercise utmost care and carry on such activities under the supervision of properly qualified personnel.

10.3 HAZARDOUS MATERIALS

Add the following sentence to Section 10.3.4:

10.3.4 No product containing asbestos, Polychlorinated Biphenyl (PCB), lead-based materials or any other hazardous material identified by the United State Environmental Protection Agency shall be incorporated into the Work.

ARTICLE 11: INSURANCE AND BONDS

11.1 CONTRACTOR'S INSURANCE AND BONDS

Add the following paragraphs to Section 11.1.2

11.1.2.1 The Contractor shall deliver the required bonds to the Owner not later than seven days following the date the Agreement is entered into, or if the work is to be commenced prior thereto in response to a letter of intent, the Contractor shall, prior to commencement of the work, submit evidence satisfactory to the Owner that such bonds will be furnished.

11.1.2.2 The Contractor shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of the power of attorney.

ARTICLE 12: UNCOVERING AND CORRECTION OF WORK

Add the following Clause 12.2.2.4 to Section 12.2.2:

12.2.2.4 Upon request by the Owner and prior to the expiration of one year from the date of Substantial Completion, the Architect will conduct and the Contractor shall attend a meeting with the Owner to review the facility operations and performance.

ARTICLE 13: MISCELLANEOUS PROVISIONS

13.1 GOVERNING LAW

Delete the language in Section 13.1 and substitute the following language:

13.1 The Contract shall be governed by the law of the place where the Project is located.

13.5 INTEREST

Delete Section 13.5.and substitute the following Section 13.5:

13.5 Payments due and unpaid under the Contract Documents shall bear interest from the date the payment is due and shall bear interest at the rate established by Section 74A.2 and 573.12, Code of Iowa, latest revision.

13.6 EQUAL EMPLOYMENT OPPORTUNITY

Add the following subparagraphs to 13.6:

13.6.1 The Contractor shall conform in all respects with the provisions of the Federal Civil Rights Act, the Code of Iowa, Chapter 216 Civil Rights Commission and the rules and regulations adopted thereto by the Iowa Civil Rights Commission. The Contractor shall not discriminate against any employee or applicant because of race, color, religion, sex, national origin, sexual orientation, gender identity, ancestry, age, marital status, physical or mental handicap. The Contractor shall require similar clauses in all of its subcontracts for service or materials.

13.6.1 The Contractor shall conform in all respects with the provisions of the Federal Civil Rights Act, the Illinois Human Rights Act and the rules and regulations adopted pursuant thereto by the Illinois Department of Human Rights. During the performance of the Contract, the Contractor shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, national origin, sexual orientation, gender identity, ancestry, age, marital status, physical or mental handicap or unfavorable discharge from military service. The Contractor shall also:

13.6.1.1 Refrain from unlawful discrimination and discrimination based on citizenship status in employment and undertake affirmative action to assure equality of employment opportunity and eliminate the effects of past discrimination.

13.6.1.2 Comply with procedures and requirements of the Department's regulations concerning equal employment opportunities and affirmative action;

13.6.1.3 Provide such information, with respect to its employees and applicants for employment, and assistance as the Department may reasonably request;

13.6.1.4 Have written sexual harassment policies that shall include, at a minimum, the following information: (i) the illegality of sexual harassment; (ii) the definition of sexual harassment under State law; (iii) a description of sexual harassment, utilizing examples; (iv) the vendor's internal complaint process including penalties; (v) the legal recourse, investigative and complaint process available through the Department and the Commission; (vi) directions on how to contact the Department and the Commission; and (vii) protection against retaliation as provided by Section 6-101 of this Act. A copy of the policies shall be provided to the Department upon request.

13.6.1.5 Require similar clauses in all of its subcontracts for services or materials.

ADD THE FOLLOWING SECTION TO ARTICLE 13:

13.7 NICOTINE FREE ZONE

Add the following subparagraph to 13.11:

13.7.1 Nicotine is not allowed on the Owner's premises which includes personal or company vehicles parked on the Owner's property.

ARTICLE 14: TERMINATION OR SUSPENSION OF THE CONTRACT

No Supplements

ARTICLE 15: CLAIMS AND DISPUTES

15.1 CLAIMS

Delete Section 15.1.2 in its entirety and substitute the following Section 15.1.2 and Clauses 15.1.2.1 thru 15.1.2.3:

15.1.2 Time Limits on Claims - As between the Owner and the Contractor, the commencement of the statutory limitation period shall be as follows:

15.1.2.1 Before Substantial Completion. As to acts or failures to act occurring prior to the relevant date of Substantial Completion, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than such date of Substantial Completion.

15.1.2.2 Between Substantial Completion and Final Certificate for Payment. As to acts or failures to act occurring subsequent to the relevant date of Substantial Completion and prior to issuance of the final Certificate for Payment, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than the date of issuance of the final Certificate for Payment.

15.1.2.3 After Final Certificate of Payment. As to acts or failures to act occurring after the relevant date of issuance of the final Certificate for Payment, any applicable statute of limitations shall commence to run and any alleged cause of action shall be deemed to have accrued in any and all events not later than the date of any act or failure to act by the Contractor pursuant to any Warranty provided under Section 3.5, the date of any correction of the Work or failure to correct the Work by the Contractor under Section 12.2, or the date of actual commission of any other act or failure to perform any duty or obligation by the Contractor or Owner, whichever occurs last.

Add Clauses 15.1.6.3 and 15.1.6.4 to Section 15.1.6:

15.1.6.3 Claims for increase in the Contract Time shall set forth in detail the circumstances that form the basis for the Claim, the date upon which each cause of delay began to affect the progress of the Work, the date upon which each cause of delay ceased to affect the progress of the Work and the number of days' increase in the Contract Time claimed as a consequence of each such cause of delay. The Contractor shall provide such supporting documentation as the Owner may require including, where appropriate, a revised construction schedule indicating all the activities affected by the circumstances forming the basis of the Claim.

15.1.6.4 The Contractor shall not be entitled to a separate increase in the Contract Time for each one of the number of causes of delay which may have concurrent or interrelated effects on the progress of the Work, or for concurrent delays due to the fault of the Contractor.

END OF SECTION

SECTION 01 1000
SUMMARY

PART 1 GENERAL

1.1 PROJECT

A. Project Name: JCC - Celebration Barn Renovation

B. Architect's Name: Shive-Hattery, Inc.

C. The Project consists of the interior renovation of the Cangleska Wakan Celebration Barn, including complete catering prep kitchen remodel including equipment, interior demolition, plumbing, electrical, and electrical service, mechanical and architectural finishes. Minor improvements to the exterior are included as needed including electrical service replacement.

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 PROJECT SCHEDULE

A. The project schedule is defined in the Advertisement for Bids.

1.4 OWNER OCCUPANCY

A. Owner intends to occupy the Project upon Substantial Completion.

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

C. Schedule the Work to accommodate Owner occupancy.

1.5 CONTRACTOR USE OF SITE AND PREMISES

A. General: Contractor shall have limited use of premises for construction operations as indicated on Drawings by the Contract limits.

B. 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.

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. Utility Outages and Shutdown:

1. Prevent accidental disruption of utility services to other facilities.

END OF SECTION

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.

1.2 RELATED REQUIREMENTS

A. Section 00 5000 - Contracting Forms and Supplements: Forms to be used.

1.3 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.
2. Submittals Schedule.
3. Contractor's Construction Schedule.

C. Use Schedule of Values Form: AIA G703, edition stipulated in the Agreement.

D. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect/Engineer 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 on the Owner/Contractor Agreement OR Owner/Contractor Agreement.

G. Include in each line item, the amount of Allowances specified in this section. For unit cost Allowances, identify quantities taken from Contract Documents multiplied by the unit cost to achieve the total for the item.

1. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
    a. Differentiate between items stored on-site and items stored off-site. If specified, include evidence of insurance or bonded warehousing.

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

I. Round amounts to nearest whole dollar; total shall equal the Contract Sum.

J. Allowances: Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.

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

1.4 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Application Times: Progress payments shall be submitted to Architect by the second Tuesday of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.

B. Form to be used: AIA Document G702 and AIA Document G703 Continuation Sheets.

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

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

E. Execute certification by signature of authorized officer.

F. Submit one electronic copy of each Application for Payment.

G. Include the following with the application:

1. Partial release of liens or other claims from major subcontractors and vendors.

a. Conditional Waivers and Releases on progress payments: With each Application for Payment, submit waivers and releases from every entity who is lawfully entitled to file a mechanic's lien, claim payment against payment bond, or any other claim for payment arising out of the Contract and related to the Work covered by the current payment.

1) The Conditional Waiver and Release is effective on the Contractor’s receipt of payment in accordance with the terms stated in form with exceptions noted.
2) Submit partial waiver and release on each item for amount requested in current application, after deduction for retainage, on each item.
3) When an application shows completion of an item, submit final or full waivers and releases.
4) Owner reserves the right to designate which entities involved in the Work must submit waivers.
5) Waiver Forms: Submit waivers and releases on form AIA G901, executed in a manner acceptable to Owner.

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

I. 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. Products list.
5. Submittals Schedule (preliminary if not final).
6. Copies of building permits.
7. Certificates of insurance and insurance policies.
8. Performance and payment bonds.
9. Data needed to acquire Owner's insurance.

J. 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. Waiver Forms: Submit waivers and releases on form AIA G903, executed in a manner acceptable to Owner.
2. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
3. AIA Document G707, "Consent of Surety to Final Payment."

END OF SECTION

SECTION 01 2300
ALTERNATES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Procedures for pricing Alternates.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Execute accepted alternates under the same conditions as other work of the Contract.

C. Schedule: A Schedule of Alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

1.5 ACCEPTANCE OF ALTERNATES

A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Accepted Alternates will be identified in the Owner-Contractor Agreement.

1.6 SCHEDULE OF ALTERNATES

A. Alternate No. 01 - Conversion of the existing wet fire suppression system to a dry fire suppression system. A complete modification, expansion, retrofit, and selective demolition of the existing fire protection systems within the entire building interior and exterior is included with the alternate bid item. The design of the dry system must comply with NFPA 13. The design of the system will be the responsibility of the contractor and, if selected, a system submittal provided to the Architect/Engineer for review. Components for the alternate may include but are not limited to design of the system, distribution piping, sprinkler heads, valves, fittings, testing, and certification of the system.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 2500
SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Procedural requirements for proposed substitutions.

1.2 RELATED REQUIREMENTS

A. Section 00 2113 - Instructions to Bidders: Restrictions on timing of substitution requests.

B. Section 00 4325 - Substitution Request Form: Required form for substitution requests made prior to award of contract (During procurement).

C. Section 00 6325 - Substitution Request Form - During Construction: Required form for substitution requests made after award of contract (During construction).

D. Section 01 3000 - Administrative Requirements: Submittal procedures, coordination.

E. Section 01 6000 - Product Requirements: Fundamental product requirements, product options, delivery, storage, and handling.

1.3 DEFINITIONS

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

1. Substitutions for Cause: Proposed due to changed Project circumstances beyond Contractor's control.

a. Unavailability.

b. Regulatory changes.

2. Substitutions for Convenience: Proposed due to possibility of offering substantial advantage to the Project.

a. Substitution requests offering advantages solely to the Contractor will not be considered.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

A. A Substitution Request for products, assemblies, materials, and equipment constitutes a representation that the submitter:

1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.

2. Agrees to provide the same warranty for the substitution as for the specified product.

3. Agrees to coordinate installation and make changes to other work that may be required for the work to be complete, with no additional cost to Owner.

4. Waives claims for additional costs or time extension that may subsequently become apparent.
5. Agrees to reimburse Owner and Architect/Engineer for review or redesign services associated with re-approval by authorities.

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

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

1. Forms indicated in the Project Manual are adequate for this purpose, and must be used.

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

1. Submit an electronic document, combining the request form with supporting data into single document.

3.2 SUBSTITUTION PROCEDURES DURING PROCUREMENT

A. Submittal Time Restrictions:

B. Submittal Form (before award of contract):

1. Submit substitution requests by completing the form in Section 00 4325; see this section for additional information and instructions. Use only this form; other forms of submission are unacceptable.

3.3 SUBSTITUTION PROCEDURES DURING CONSTRUCTION

A. Submittal Form (after award of contract):

1. Submit substitution requests by completing the form in Section 00 6325; see this section for additional information and instructions. Use only this form; other forms of submission are unacceptable.

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

C. Submit request for Substitution for Convenience immediately upon discovery of its potential advantage to the project, but not later than 14 days prior to time required for review and approval by Architect/Engineer, in order to stay on approved project schedule.

1. In addition to meeting general documentation requirements, document how the requested substitution benefits the Owner through cost savings, time savings, greater energy conservation, or in other specific ways.
2. Document means of coordinating of substitution item with other portions of the work, including work by affected subcontractors.
3. Bear the costs engendered by proposed substitution of:
    a. Owner's compensation to the Architect/Engineer for any required redesign, time spent processing and evaluating the request.
    b. Other construction by Owner.
    c. Other unanticipated project considerations.

D. Substitutions will not be considered under one or more of the following circumstances:

1. When they are indicated or implied on shop drawing or product data submittals, without having received prior approval.
2. Without a separate written request.
3. When acceptance will require revisions to Contract Documents.

3.4 RESOLUTION

A. Architect/Engineer may request additional information and documentation prior to rendering a decision. Architect will request information or documentation within 7 days of receipt of a request for substitution.

B. Architect/Engineer will notify Contractor in writing of decision to accept or reject request within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.

3.5 ACCEPTANCE

A. Accepted substitutions change the work of the Project. They will be documented and incorporated into work of the project by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments provided for in the Conditions of the Contract.

3.6 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. Include completed Substitution Request Forms as part of the Project record. Include both approved and rejected Requests.

END OF SECTION

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 specificed 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 Software-Generated Proposal Request.

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.

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: Software-Generated Change Order form provided by Architect. A sample form is available upon request..

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 EJCDC Document C-940. 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

SECTION 01 3000
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. General administrative requirements.

B. Preconstruction meeting.

C. Pre-installation meeting.

D. Progress meetings.

E. Construction progress schedule.

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

G. Number of copies of submittals.

H. Requests for Interpretation (RFI) procedures.

I. Submittal procedures.

J. Administrative and supervisory personnel

K. Requests for information (RFI).

1.2 RELATED REQUIREMENTS

A. Section 01 3216 - Construction Progress Schedule: Form, content, and administration of schedules.

B. Section 01 6000 - Product Requirements: General product requirements.

C. Section 01 7000 - Execution and Closeout Requirements: Additional coordination requirements.

D. Section 01 7800 - Closeout Submittals: Project record documents; operation and maintenance data; warranties and bonds.

1.3 REFERENCE STANDARDS

A. AIA G810 - Transmittal Letter; 2001.

1.4 GENERAL ADMINISTRATIVE REQUIREMENTS

A. Comply with requirements of Section 01 7000 - Execution and Closeout Requirements for coordination of execution of administrative tasks with timing of construction activities.

B. Make the following types of submittals to Architect/Engineer:

1. Requests for Interpretation (RFI).
2. Requests for substitution.
3. Shop drawings, product data, and samples.
4. Test and inspection reports.
5. Design data.
6. Manufacturer's instructions and field reports.

7. Applications for payment and change order requests.
8. Progress schedules.
9. Coordination drawings.
10. Correction Punch List and Final Correction Punch List for Substantial Completion.
11. Closeout submittals.

1.5 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. Field and File: Written information that does not require Architect's responsive action. Information required to be accessed on site, for example; Safety Data Sheets, construction te.

1.6 PROJECT COORDINATION

A. Each contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.

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.
7. Project closeout activities.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to the 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.

1.7 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 the 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 the Project.

1.8 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.

1.9 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. RFIs 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 RFIs 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 RFIs without delegation to the Architect.
4. Promptly submit any RFIs 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.

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 RFIs 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 RFIs, i.e., RFIs 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 RFIs, i.e., RFIs, wherein the same information is requested more than once, even if phrased in another format or asked in a different manner. Confirming& Repetitive RFIs are considered frivolous.
10. The Contractor shall not retain or suppress RFIs for group submissions. Each individual RFI is to be submitted expeditiously upon occurrence. Numerous RFIs 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.
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 RFIs: Software-generated form with substantially the same content as indicated above.

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. RFIs 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. The following RFIs will be returned without action:
    a. Requests for approval of submittals.
    b. Requests for approval of substitutions or deviations.
    c. Requests for coordination information already indicated in the Contract Documents.
    d. Requests for adjustments in the Contract Time or the Contract Sum.
    e. Requests for interpretation of Architect's actions on submittals.
    f. Incomplete, inaccurate, invalid, and unjustified RFIs or RFIs with numerous errors.
    g. Confirming or Repetitive RFIs.
2. Architect's action may include a request for additional information, in which case Architect's time for response will start again.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit a Change Proposal according to Division 01 Section "Contract Modification Procedures."
    a. If the Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within seven days of receipt of the RFI response.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 PRECONSTRUCTION MEETING

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

B. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.

C. Attendance Required Authorized Representatives of:

1. Owner.
2. Architect/Engineer and their subconsultants.
3. Contractor and its superintendent; major subcontractors; suppliers, and other concerned parties.

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. Procedure for maintaining Record Documents.
5. Use of premises and existing building.
6. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
7. Submission of initial Submittal schedule.
8. Designation of personnel representing the parties to Contract and their duties.
9. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
10. Scheduling (tentative construction schedule and phasing).
11. Critical work sequencing and long-lead items.
12. Procedures for RFIs.
    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.
13. Procedures for testing and inspecting.
14. Work restrictions.
15. Owner's occupancy requirements.
16. Responsibility for temporary facilities and controls.
17. Construction waste management and recycling.

18. Parking availability.
19. Office, work, and storage areas.
20. Equipment deliveries and priorities.
21. Warranties and Warranty requirements.
22. First aid.
23. Safety and Security.
24. Progress cleaning.
25. Working hours.

E. Architect will record minutes and distribute copies within two days after meeting to participants, with two copies to Architect/Engineer, Owner, Contractor participants, and those affected by decisions made.

3.2 PREINSTALLATION MEETINGS

A. Architect will schedule a meeting at the Project site prior to Contractor occupancy.

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

1. Contractor.
2. Owner.
3. Architect/Engineer.
4. Contractor's superintendent.
5. Major subcontractors.

C. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

1. The Contract Documents.
2. Use of premises by Owner and Contractor.
3. Construction facilities and controls provided by Owner.
4. Temporary utilities provided by Owner.
5. Temporary facilities and controls.
6. Security and housekeeping procedures.
7. Schedules, including time schedules.
8. Application for payment procedures.
9. Procedures for testing and inspecting requirements.
10. Procedures for maintaining record documents.
11. Incomplete, illegitimate, or frivolous Contractor's requests for information and requests for information that are not prepared in accordance with the Contract Documents.
12. 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.
13. Related RFIs.

14. Deliveries.
15. Review of mockups.
16. Compatibility problems.
17. Weather limitations.
18. Manufacturer's written recommendations.
19. Warranty requirements.
20. Space and access limitations.
21. Installation procedures.
22. Protection of adjacent work.
23. Protection of construction and personnel.

D. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

E. Record minutes and distribute copies within two days after meeting to participants, with electronic copies to Architect/Engineer, Owner, participants, and those affected by decisions made. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.

3.3 PROGRESS MEETINGS

A. Schedule and administer meetings throughout progress of the Work at maximum bi-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/Engineer, Contractor Project Manager and Job Superintendent 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.
2. Review of work progress.
3. Field observations, problems, and decisions.
4. Identification of problems that impede, or will impede, planned progress.
5. Review of submittals schedule and status of submittals.
6. Review of RFIs log and status of responses.
7. Review of off-site fabrication and delivery schedules.
8. Maintenance of progress schedule.
9. Corrective measures to regain projected schedules.
10. Planned progress during succeeding work period.
11. Coordination of projected progress.
12. Maintenance of quality and work standards.
13. Effect of proposed changes on progress schedule and coordination.

14. Access.
15. Site utilization.
16. Temporary facilities and controls.
17. Work hours.
18. Hazards and risks.
19. Progress cleaning.
20. Status of correction of deficient items.
21. Field observations.
22. RFIs.
23. Status of proposal requests.
24. Status of Change Orders.
25. Pending claims and disputes.
26. Documentation of information for payment requests.
27. Other business relating to work.

E. Record minutes and distribute copies within two days after meeting to participants, and those affected by decisions made.

3.4 PROJECT CLOSEOUT CONFERENCE

A. Schedule the conference to review requirements and responsibilities related to project closeout. Set a time convenient to Owner and Architect, but no later than 30 days prior to the scheduled date of substantial completion.

1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and their superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with the Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
    a. Procedures required prior to Substantial Completion Inspection and Final Completion Inspection.
        1) Procedure to request Architect review to determine the date of of Substantial Completion.
        2) Preparation and submission of Contractor's punch list.
        3) Architect's process for Substantial Completion review and preparation of the supplemental and final punch lists.
    b. Procedures for processing Applications for Payment at Substantial Completion and Final Completion.
    c. Requirements for completing Closeout Documentation.
        1) Affidavits
        2) Release of Claims or Liens
    d. Completion time for correcting defective work.
    e. Partial release of Retainage
    f. Preparation and submission of Record Documents

g. Responsibility for removing temporary facilities and controls.

h. Final cleaning

i. Preparation for final completion review.

3. Record minutes and distribute copies within two days after meeting to participants, and those affected by decisions made.

3.5 CONSTRUCTION PROGRESS SCHEDULE- SEE SECTION 01 3216

A. Within 10 days after date of the Agreement, submit preliminary schedule defining planned operations for the first 60 days of work, with a general outline for remainder of work.

B. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.

1. Include written certification that major contractors have reviewed and accepted proposed schedule.

C. Submit updated schedule with each Application for Payment.

3.6 REQUESTS FOR INTERPRETATION (RFI)

A. Definition: A request seeking one of the following:

1. An interpretation, amplification, or clarification of some requirement of Contract Documents arising from inability to determine from them the exact material, process, or system to be installed; or when the elements of construction are required to occupy the same space (interference); or when an item of work is described differently at more than one place in Contract Documents.

2. A resolution to an issue which has arisen due to field conditions and affects design intent.

B. Whenever possible, request clarifications at the next appropriate project progress meeting, with response entered into meeting minutes, rendering unnecessary the issuance of a formal RFI.

C. Preparation: Prepare an RFI immediately upon discovery of a need for interpretation of Contract Documents. Failure to submit a RFI in a timely manner is not a legitimate cause for claiming additional costs or delays in execution of the work.

1. Prepare a separate RFI for each specific item.

a. Review, coordinate, and comment on requests originating with subcontractors and/or materials suppliers.

b. Do not forward requests which solely require internal coordination between subcontractors.

2. Prepare in a format and with content acceptable to Owner.

3. Prepare using software provided by the Electronic Document Submittal Service.

D. Reason for the RFI: Prior to initiation of an RFI, carefully study all Contract Documents to confirm that information sufficient for their interpretation is definitely not included.

1. Include in each request Contractor's signature attesting to good faith effort to determine from Contract Documents information requiring interpretation.

2. Unacceptable Uses for RFIs: Do not use RFIs to request the following::

a. Approval of substitutions (see Section - 01 6000 - Product Requirements)

3. Improper RFIs: Requests not prepared in compliance with requirements of this section, and/or missing key information required to render an actionable response. They will be returned without a response, with an explanatory notation.

3.7 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/Engineer for review for the limited purpose of checking for compliance with information given and the design concept expressed in Contract Documents.

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

D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 7800 - Closeout Submittals.

3.8 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:

1. Design data.
2. Certificates.
3. Test reports.
4. Inspection reports.
5. Manufacturer's instructions.
6. Manufacturer's field reports.
7. Other types indicated.

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

3.9 NUMBER OF COPIES OF SUBMITTALS

A. Electronic Documents: Submit one electronic copy in Adobe Portable Document Format PDF format; an electronically-marked up file will be returned. Create PDFs at native size and right-side up; illegible files will be rejected. Submit separate PDF files for each specification section. Multiple sections combined into one PDF file will be returned to the Contractor.

1. Name Files according to the following format: <Section Number> <Item Description>. For example: 08 1113 Hollow Metal Doors Shop Drawings.
2. For shop drawings, the size of the electronic image must be equal with the standard paper size of the sheet, for example:
3. A 30” x 42” drawing should not be placed on an 11” x 17” sheet size.
4. An 11” x 17” drawing should not be placed on a 30” x 42” sheet size.
5. For electronic shop drawings larger than 11” x 17”, one hard copy of the drawing(s) is required to be submitted with the electronic copy. The hard copy will NOT be returned to the Contractor.
6. If the Architect deems the electronic submittal illegible, corrupted, and unusable, or if the file size is unreasonably large, then a new electronic copy or hard copy will be required.

B. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect/Engineer.

1. After review, produce duplicates of the Architect's review information.
2. Retained samples will not be returned to Contractor unless specifically so stated.

3.10 SUBMITTAL PROCEDURES

A. General Requirements:

1. Transmit using approved form.
2. Sequentially identify each item. For revised submittals use original number and a sequential numerical suffix.
3. Schedule submittals to expedite the Project, and coordinate submission of related items.
    a. For each submittal for review, allow 15 days excluding delivery time to and from the Contractor.
    b. For sequential reviews involving Architect/Engineer's consultants, Owner, or another affected party, allow an additional 7 days.

B. Product Data Procedures:

1. Submit only information required by individual specification sections.
2. Collect required information into a single submittal.
3. Do not submit (Material) Safety Data Sheets for materials or products.

C. Shop Drawing Procedures:

1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting the Contract Documents and coordinating related Work.
2. Generic, non-project specific information submitted as shop drawings do not meet the requirements for shop drawings.

D. Submittal System: The contractor will provide electronic submittals using Newforma Konekt provided by the Architect/Engineer

E. Submittal Schedule:

1. In preparing the schedule, the Contractor should consider time required for review, ordering, manufacturing, fabrication, and delivery plus include additional time required for making corrections or revision to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.
    a. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor’s construction schedule.
    b. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
    c. Final Submittal: Submit concurrently with the first complete submittal of Contractor’s construction schedule. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
    d. Format: Arrange the following information in a tabular format:

1) Schedule date for first submittal.
2) Specification Section number and title.
3) Submittal category: Action or Informational.
4) Name of subcontractor.
5) Description of the Work covered.
6) Scheduled date for Architect's final release or approval.
7) Scheduled date of fabrication.
8) Scheduled dates for purchasing.
9) Scheduled dates for installation.
10) Activity or event number.

F. 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.

G. 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 15 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 15 days for review of each resubmittal.
4. Sequential Review: Where the Contract Documents indicate that submittals shall be reviewed sequentially by Architect's consultants, Owner, or other parties, allow 21 days for initial review of each submittal
5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.

6. Except for required concurrent reviews, the Contractor shall not retain or suppress submittals for group submissions. Each individual submittal is to be transmitted expeditiously upon preparation. Numerous submittals transmitted in a short time period will not be considered reasonable, and will result in review times being extended accordingly. In such cases, the Contractor may request priority consideration of certain submittals.
7. 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.

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).

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.

3.11 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. Submit Product Data before or concurrent with Samples.

3.12 INFORMATIONAL SUBMITTALS

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

B. 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.

C. Material Safety Data Sheets (SDS): Submit information directly to Owner; do not submit to Architect except as required in "Action Submittals" Article.

3.13 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.

3.14 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.
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. Testing and inspection agencies and services.

B. Control of installation.

C. Defect Assessment.

1.2 RELATED REQUIREMENTS

A. Section 01 4216 - Definitions.

1.3 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.

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/Engineer 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 TESTING AND INSPECTION

A. Testing Agency Duties:

1. Provide qualified personnel at site. Cooperate with Architect/Engineer 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/Engineer and Contractor of observed irregularities or non-compliance of Work or products.
5. Perform additional tests and inspections required by Architect/Engineer.
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.
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/Engineer 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/Engineer.

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. 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.

3.5 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not complying with specified requirements.

END OF SECTION

SECTION 01 4216
DEFINITIONS

PART 1 GENERAL

1.1 SUMMARY

A. This section supplements the definitions contained in the Drawings general provisions of the Contract, including General and Supplementary Conditions.

B. Other definitions are included in individual specification sections.

1.2 DEFINITIONS

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

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

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

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

E. "Furnish" or "Supply": To supply, deliver to Project site, unload, and inspect for damage.

F. "Install": Operations at Project site including to temporarily store, unpack, assemble, erect, apply, place, anchor, work to dimension, finish, cure, protect, clean, start up, and make ready for use.

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

H. "Product": Material, machinery, components, equipment, fixtures, and systems forming the work result. Not materials or equipment used for preparation, fabrication, conveying, or erection and not incorporated into the work result. Products may be new, never before used, or re-used materials or equipment.

I. "Project Manual": The book-sized volume that includes the procurement requirements (if any), the contracting requirements, and the specifications.

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

1.3 INDUSTRY STANDARDS

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

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents, unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

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

D. Abbreviations and Acronyms for Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the generally recognized name of the standards and regulations or as indicated.

1.4 ABBREVIATIONS AND ACRONYMS

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

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

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. Provide and pay for all electrical power, lighting, water, and ventilation required for construction purposes.

B. Existing facilities may be used.

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

1.3 TEMPORARY SANITARY FACILITIES

A. Use of existing facilities is permitted.

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. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.

C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.5 FENCING

A. Construction: Contractor's option.

1.6 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.

1.7 VEHICULAR ACCESS AND PARKING

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

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

C. Existing parking areas may be used for construction parking.

1.8 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.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION

SECTION 01 6000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

A. Section 01 2500 - Substitution Procedures: Substitutions made during procurement and/or construction phases.

B. Section 01 7419 - Construction Waste Management and Disposal: Waste disposal requirements potentially affecting product selection, packaging and substitutions.

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

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

C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.

1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

D. 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 7 days of receipt of additional information or documentation, whichever is later.
    a. Form of Approval: Comply with requirements specified in Division 01 "Administrative Requirements."

1.4 COMPATIBILITY OF OPTIONS

A. 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.

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 NEW PRODUCTS

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

B. Use of products having any of the following characteristics is not permitted:

C. Where other criteria are met, Contractor shall give preference to products that:

1. If used on interior, have lower emissions.

2. If wet-applied, have lower VOC content.

2.2 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.

PART 3 EXECUTION

3.1 SUBSTITUTION LIMITATIONS

A. See Section 01 2500 - Substitution Procedures.

3.2 TRANSPORTATION AND HANDLING

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

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

C. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft.

D. 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.

E. 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.

F. 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.

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

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

I. 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.

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

K. 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. See Section 01 7419.

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

C. Store with seals and labels intact and legible.

D. Store sensitive products in weathertight, climate-controlled enclosures in an environment favorable to product.

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

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

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

H. Cover products subject to deterioration by the elements, above ground, with impervious sheet covering. Provide adequate ventilation to prevent condensation and degradation of products.

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

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

K. 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.

L. Store materials in a manner that will not endanger Project structure.

M. Store cementitious products and materials on elevated platforms.

N. 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.

O. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage

P. Protect stored products and liquids from damage from freezing

Q. 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

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.

C. Cutting and patching.

D. Surveying for laying out the work.

E. Cleaning and protection.

F. Substantial Completion.

G. Final Completion.

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

I. General requirements for maintenance service.

1.2 QUALIFICATIONS

A. For surveying work, employ a land surveyor registered in the State in which the Project is located and acceptable to Architect/Engineer. Submit evidence of surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate. Employ only individual(s) trained and experienced in collecting and recording accurate data relevant to ongoing construction activities,

1.3 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. Notify affected utility companies and comply with their requirements.

C. 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.

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

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

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

G. 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.

1.4 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. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
3. 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.
4. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
5. Submit changeover information related to Owner's occupancy, use, operation, and maintenance (including Operation & Maintenance Manuals).
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.

1.5 FINAL COMPLETION

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

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 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 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.

1.6 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.

1.7 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.
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.

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

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.

G. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.

H. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

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

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

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

D. Temporary Support: Provide temporary support of Work to be cut.

E. 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.

F. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

G. 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. Verify locations of survey control points prior to starting work.

B. Promptly notify Architect/Engineer of any discrepancies discovered.

C. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

D. Promptly report to Architect/Engineer the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

E. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect/Engineer.

F. Utilize recognized engineering survey practices.

G. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:

1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
2. Grid or axis for structures.
3. Building foundation, column locations, ground floor elevations.

H. Periodically verify layouts by same means.

I. Maintain a complete and accurate log of control and survey work as it progresses.

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.

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

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

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

3.5 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 indicated.
2. Report discrepancies to Architect/Engineer 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.
3. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
4. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.

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. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

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

B. See Alterations article above for additional requirements.

C. Perform whatever cutting and patching is necessary to:

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

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

E. Employ skilled and experienced installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

F. Cut rigid materials such as concrete and masonry 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 airtight 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 in accordance with Section 07 8400, 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.
4. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
5. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
    a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    b. Restore damaged pipe covering to its original condition.
6. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
    a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
7. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
8. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

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. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

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

3.9 ADJUSTING

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

3.10 FINAL CLEANING

A. 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.

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

1. Use cleaning materials that are nonhazardous.
2. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
3. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.
4. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
5. Clean filters of operating equipment.
6. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, and drainage systems.
7. Clean site; sweep paved areas, rake clean landscaped surfaces.
8. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.
9. Remove tools, construction equipment, machinery, and surplus material from Project site.
10. Leave Project clean and ready for occupancy.

3.11 CLOSEOUT PROCEDURES

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

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

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

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

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

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

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

H. Complete items of work determined by Architect/Engineer listed in executed Certificate of Substantial Completion.

3.12 MAINTENANCE

A. Provide service and maintenance of components indicated in specification sections.

B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.

C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION

SECTION 01 7419
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.1 WASTE MANAGEMENT REQUIREMENTS

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

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

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

D. Contractor Reporting Responsibilities: Submit periodic Waste Disposal Reports; report landfill disposal, incineration, recycling, salvage, and reuse regardless of to whom the cost or savings accrues; use the same units of measure on required reports.

E. Methods of trash/waste disposal that are not acceptable are:

1. Burning on the project site.
2. Burying on the project site.
3. Dumping or burying on other property, public or private.
4. Other illegal dumping or burying.

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

1.2 DEFINITIONS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

1.3 SUBMITTALS

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

B. Waste Disposal Reports: Submit at specified intervals, with details of quantities of trash and waste, means of disposal or reuse, and costs; show both totals to date and since last report.

1. Submit updated Report with each Application for Progress Payment; failure to submit Report will delay payment.
2. Submit Report on a form acceptable to Owner.
3. Landfill Disposal: Include the following information:
    a. Identification of material.
    b. Amount, in tons or cubic yards (cubic meters), of trash/waste material from the project disposed of in landfills.
    c. State the identity of landfills, total amount of tipping fees paid to landfill, and total disposal cost.
    d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
4. Incinerator Disposal: Include the following information:
    a. Identification of material.
    b. Amount, in tons or cubic yards (cubic meters), of trash/waste material from the project delivered to incinerators.
    c. State the identity of incinerators, total amount of fees paid to incinerator, and total disposal cost.
    d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.
5. Recycled and Salvaged Materials: Include the following information for each:
    a. Identification of material, including those retrieved by installer for use on other projects.
    b. Amount, in tons or cubic yards (cubic meters), date removed from the project site, and receiving party.

c. Transportation cost, amount paid or received for the material, and the net total cost or savings of salvage or recycling each material.

d. Include manifests, weight tickets, receipts, and invoices as evidence of quantity and cost.

e. Certification by receiving party that materials will not be disposed of in landfills or by incineration.

6. Material Reused on Project: Include the following information for each:

a. Identification of material and how it was used in the project.

b. Amount, in tons or cubic yards (cubic meters).

c. Include weight tickets as evidence of quantity.

7. Other Disposal Methods: Include information similar to that described above, as appropriate to disposal method.

PART 3 EXECUTION

2.1 WASTE MANAGEMENT PROCEDURES

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

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

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

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

2.2 WASTE MANAGEMENT PLAN IMPLEMENTATION

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

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

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

D. Meetings: Discuss trash/waste management goals and issues at project meetings.

1. Prebid meeting.

2. Preconstruction meeting.

3. Regular job-site meetings.

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

1. Provide containers as required.

2. Provide adequate space for pick-up and delivery and convenience to subcontractors.

3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

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

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

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

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

END OF SECTION

SECTION 01 7800
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.1 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/Engineer 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/Engineer 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/Engineer 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. Addenda.
   3. Change Orders and other modifications to the Contract.
   4. Reviewed shop drawings, product data, and samples.

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

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

D. Record information concurrent with construction progress.

E. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
   1. Field changes of dimension and detail.
   2. Details not on original Contract drawings.

3.2 OPERATION AND MAINTENANCE DATA

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

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

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

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

3.3 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. For Each Product, Applied Material, and Finish:
   1. Product data, with catalog number, size, composition, and color and texture designations.
   2. Information for re-ordering custom manufactured products.

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

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

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

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

3.4 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. For Each Item of Equipment and Each System:

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

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

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

D. Include color coded wiring diagrams as installed.

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

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

1. Include HVAC outdoor and exhaust air damper calibration strategy.

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

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

I. Include sequence of operation by controls manufacturer.

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

K. Include test and balancing reports.

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

3.5 ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS

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

B. 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/Engineer, Consultants, Contractor and subcontractors, 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.

3.6 WARRANTIES AND BONDS

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

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

C. Co-execute submittals when required.

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

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

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

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

END OF SECTION

SECTION 02 4100
DEMOLITION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Selective demolition of building elements for alteration purposes.

B. Abandonment and removal of existing utilities and utility structures.

1.2 RELATED REQUIREMENTS

A. Section 00 3100 - Available Project Information: Existing building survey conducted by Owner; information about known hazardous materials.

B. Section 01 1000 - Summary: Limitations on Contractor's use of site and premises.

C. Section 01 1000 - Summary: Sequencing and staging requirements.

D. Section 01 1000 - Summary: Description of items to be removed by Owner.

E. Section 01 1000 - Summary: Description of items to be salvaged or removed for re-use by Contractor.

F. Section 01 5000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

G. Section 01 5713 - Temporary Erosion and Sediment Control.

H. Section 01 6000 - Product Requirements: Handling and storage of items removed for salvage and relocation.

I. Section 01 7000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.

J. Section 01 7419 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.

K. Section 31 2323 - Fill: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

1.3 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2022, with Errata (2021).

1.4 SUBMITTALS

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

B. Site Plan: Indicate:

1. Areas for temporary construction and field offices.

C. Demolition Plan: Submit demolition plan as required by OSHA and local AHJs.

1. Indicate extent of demolition, removal sequencing, bracing and shoring, and location and construction of barricades and fences.

2. Demolition firm qualifications.

D. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

E. The Contractor shall submit demolition procedures and operational sequence for review and acceptance by the Architect/Engineer if a portion of the existing facility is to remain in operation during construction and phasing is not specified in the plans or specifications.

F. Schedule indicating proposed sequence of operations for selective demolition work to Architect/Engineer for review prior to start of work. Include coordination for shutoff, capping, and continuation of utility services as required, together with details for dust and noise control protection.

1.5 QUALITY ASSURANCE

A. Demolition Firm Qualifications: Company specializing in the type of work required.

PART 2 EXECUTION

2.1 DEMOLITION

A. Remove other items indicated, for salvage, relocation, and recycling.

B. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill;

2.2 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with requirements in Section 01 7000.

B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.

1. Obtain required permits.
2. Comply with applicable requirements of NFPA 241.
3. Use of explosives is not permitted.
4. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
5. Provide, erect, and maintain temporary barriers and security devices.
6. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
7. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
8. Do not close or obstruct roadways or sidewalks without permits from authority having jurisdiction.
9. Conduct operations to minimize obstruction of public and private entrances and exits. Do not obstruct required exits at any time. Protect persons using entrances and exits from removal operations.
10. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon, or limit access to their property.

C. Do not begin removal until receipt of notification to proceed from Owner.

D. Do not begin removal until built elements to be salvaged or relocated have been removed.

E. Protect existing structures and other elements to remain in place and not removed.

1. Provide bracing and shoring.
2. Prevent movement or settlement of adjacent structures.
3. Stop work immediately if adjacent structures appear to be in danger.

F. Minimize production of dust due to demolition operations. Do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

G. Perform demolition in a manner that maximizes salvage and recycling of materials.

1. Dismantle existing construction and separate materials.
2. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

2.3 EXISTING UTILITIES

A. Coordinate work with utility companies. Notify utilities before starting work, comply with their requirements, and obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

H. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone. Identify and mark, in same manner as other utilities to remain, utilities to be reconnected.

I. Contractor is responsible for the adjustment of all gas vents, manholes, castings, and water valves to match the new surface. Adjustments shall be coordinated with the utility companies and the cost for all adjustments shall be incidental to construction. Any damage to said structures and appurtenances, that occurs during construction, shall be repaired by the Contractor at no additional cost to the Owner.

2.4 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Existing construction and utilities indicated on drawings are based on casual field observation and existing record documents only.

1. Verify construction and utility arrangements are as indicated.
2. Report discrepancies to Architect/Engineer before disturbing existing installation.
3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.

B. Maintain weatherproof exterior building enclosure, except for interruptions required for replacement or modifications; prevent water and humidity damage.

C. Remove existing work as indicated and required to accomplish new work.

1. Remove items indicated on drawings.

D. Services including, but not limited to, HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications: Remove existing systems and equipment as indicated.

1. Maintain existing active systems to remain in operation, and maintain access to equipment and operational components.
2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
3. See Section 01 1000 - Summary for limitations on outages and required notifications.
4. Verify that abandoned services serve only abandoned facilities before removal.
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.

E. Protect existing work to remain.

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

2.5 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 03 3000
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:

1. Slabs-on-grade.
2. Concrete toppings.
3. Insulated concrete sandwich wall panel systems.

1.2 REFERENCE STANDARDS

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

B. AASHTO M 182 - Standard Specification for Burlap Cloth Made from Jute or Kenaf and Cotten Mats; 2005.

C. ACI 117 - Specification for Tolerances for Concrete Construction and Materials; 2010 (Reapproved 2015).

D. ACI 301 - Specifications for Concrete Construction; 2020.

E. ACI 302.1R - Guide to Concrete Floor and Slab Construction; 2015.

F. ACI 305R - Guide to Hot Weather Concreting; 2020.

G. ACI 306R - Guide to Cold Weather Concreting; 2016.

H. ACI 347R - Guide to Formwork for Concrete; 2014 (Reapproved 2021).

I. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2022.

J. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2022.

K. ASTM A775/A775M - Standard Specification for Epoxy-Coated Steel Reinforcing Bars; 2022.

L. ASTM A934/A934M - Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars; 2016.

M. ASTM C1017/C1017M - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete; 2013.

N. ASTM C1059/C1059M - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 2021.

O. ASTM C1064/C1064M - Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete; 2012.

P. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 50 mm [2 in.] Cube Specimens); 2023.

Q. ASTM C1116/C1116M - Standard Specification for Fiber-Reinforced Concrete; 2023.

R. ASTM C1315 - Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete; 2019.

S. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2020.

T. ASTM C150/C150M - Standard Specification for Portland Cement; 2022.

U. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2020.

V. ASTM C172/C172M - Standard Practice for Sampling Freshly Mixed Concrete; 2017.

W. ASTM C219 - Standard Terminology Relating to Hydraulic Cement; 2014.

X. ASTM C231/C231M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method; 2014.

Y. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a (Reapproved 2016).

Z. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field; 2024.

AA. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2023.

BB. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2023.

CC. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2019, with Editorial Revision (2022).

DD. ASTM C595/C595M - Standard Specification for Blended Hydraulic Cements; 2021.

EE. ASTM C618 - Standard Specification for Coal Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2023, with Editorial Revision.

FF. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 2020a.

GG. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2024.

HH. ASTM D1709 - Standard Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method; 2016a, with Editorial Revision (2017).

II. ASTM D3963/D3963M - Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars; 2021.

JJ. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting; 2018.

KK. ASTM E1155 - Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers; 2020.

LL. ASTM E1643 - Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs; 2018a.

MM. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs; 2017 (Reapproved 2023).

NN. ASTM F1249 - Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor; 2020.

OO. AWS D1.4/D1.4M - Structural Welding Code - Steel Reinforcing Bars; 2018, with Amendment (2020).

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mixing water to be withheld for later addition at Project site.

C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

D. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.

1. Location of construction joints is subject to approval of the Architect.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For installer and manufacturer.

B. Welding certificates.

C. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Fiber reinforcement.
6. Waterstops.
7. Floor and slab treatments.
8. Bonding agents.
9. Adhesives.
10. Vapor barriers.
11. Joint-filler strips.
12. Repair materials.

D. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:

1. Aggregates. Include test results per ASTM C295 indicating aggregate is free of materials with deleterious reactivity to alkali in cement.

E. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

F. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C1077 and ASTM E329 for testing indicated.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D1.4M, "Structural Welding Code - Reinforcing Steel."

F. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specifications for Structural Concrete, Sections 1 through 5.

2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 PRODUCTS

2.1 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Void Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.

D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.

E. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

F. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

G. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that will leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.
2. Furnish ties that, when removed, will leave holes no larger than 1 inch (25 mm) in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A615/A615M, Grade 60 (Grade 420), deformed.

B. Epoxy-Coated Reinforcing Bars:ASTM A615/A615M Grade 60, deformed bars, ASTM A775/A775M or ASTM A934/A934M, epoxy coated, with less than 2 percent damaged coating in each 12 inch (300 mm) bar length.

C. Plain-Steel Welded Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat sheets.

2.3 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
2. Supporting reinforcement on clay brick supports is not acceptable.

2.4 CONCRETE MATERIALS

A. Cementitious Material: Use one of the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C150/C150M, Type I/II, gray Supplement with the following at contractor's option:
    a. Fly Ash: ASTM C618, Class C.
    b. CarbonCure: www.carboncure.com
2. Blended Hydraulic Cement: ASTM C595/C595M, Type IL, portland-limestone cement.
    a. Fly Ash: ASTM C618, Class C.

B. Normal-Weight Aggregates: ASTM C33/C33M, Class 3S coarse aggregate or better, graded. Provide aggregates from a single sourcewith documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size: 1 inch (25 mm) nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement. For slabs-on-grade or concrete exposed to view, use fine aggregate with a proven history of not being susceptible to popouts, use imported sand if necessary.

C. Water: ASTM C94/C94M and potable.

2.5 ADMIXTURES

A. Air-Entraining Admixture: ASTM C260/C260M.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
2. Retarding Admixture: ASTM C494/C494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.

2.6 FIBER REINFORCEMENT

A. Synthetic Macro-Fiber: Polyolefin macro-fibers engineered and designed for use in concrete, complying with ASTM C1116/C1116M Type III, 1 to 2 1/4 inch (25 to 57 mm) long.

2.7 WATERSTOPS

A. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch (19 by 25 mm).

2.8 VAPOR BARRIERS

A. Sheet Vapor Barrier, ASTM E1745, Class A . Include manufacturer's recommended adhesive or pressure-sensitive tape.

1. Minimum thickness; 15 mil.
2. Water Vapor Permeance, ASTM F1249 Section 7; less than 0.01 Perms.
3. Tensile Strength, ASTM D882 Section 9; 45 lb/in minimum.
4. Puncture Resistance, ASTM D1709, Test Method B; 2200 grams minimum.

2.9 LIQUID FLOOR TREATMENTS

A. VOC Content: Liquid floor treatments shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.

2.10 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.

C. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C1315, Type 1, Class A.

1. VOC Content: Curing and sealing compounds shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.11 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: Flexible, closed-cell polyethylene with tear off strip for sealant installation.

B. Bonding Agent: ASTM C1059/C1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

C. Epoxy Bonding Adhesive: ASTM C881/C881M, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:

1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.12 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C150/C150M, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C219.

2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.

3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by underlayment manufacturer.

4. Compressive Strength: Not less than 4100 psi (29 MPa) at 28 days when tested according to ASTM C109/C109M.

2.13 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials:Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 25 percent.

2. CarbonCure: CarbonCure injected carbon dioxide system is permitted at contractor's option to reduce Portland cement content by up to 3%. CarbonCure shall be added to the mix using the CarbonCure delivery system. The delivery shall be provided and calibrated by CarbonCure and integrated into the PCC plant batching system. The reduction is for Portland cement only and is determined after substitution of fly ash has occured. Blended cements are to be considered cement when determining Portland cement reductions.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.

D. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing or high-range water-reducing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

2.14 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.45.
3. Slump Limit: Concrete mix shall be proportioned to achieve a maximum slump of 9" for concrete containing high range water reducing admixture, 6" for concrete containing a mid-range water reducing admixture, or 4" for other concrete. All mixes shall have a water slump of 2" to 3".
4. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

B. Concrete Toppings: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.
2. Minimum Cementitious Materials Content: 520 lb/cu. yd. (309 kg/cu. m).
3. Slump Limit: Concrete mix shall be proportioned to achieve a maximum slump of 9" for concrete containing high range water reducing admixture, 6" for concrete containing a mid-range water reducing admixture, or 4" for other concrete. All mixes shall have a water slump of 2" to 3".
4. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

2.15 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.16 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C94/C94Mand ASTM C1116/C1116M, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:

1. Class A, 1/8 inch (3.2 mm) for smooth-formed finished surfaces.
2. Class B, 1/4 inch (6 mm) for rough-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 VAPOR BARRIERS

A. Sheet Vapor Barriers: Place, protect, and repair sheet vapor barrier according to ASTM E1643 and manufacturer's written instructions.

1. Lap joints 6 inch (150 mm) and seal with manufacturer's recommended tape.

3.5 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor barrier. Repair damage and reseal vapor barrier before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

1. Weld reinforcing bars according to AWS D1.4/D1.4M, where indicated.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

F. Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D3963/D3963M. Use epoxy-coated steel wire ties to fasten epoxy-coated steel reinforcement.

3.6 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Space vertical joints in walls at distance needed for construction sequencing. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8 inch (3.2 mm) wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
2. Terminate full-width joint-filler strips not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished concrete surface where joint sealants, specified in Division 07 section "Joint Sealants," are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

3.7 WATERSTOPS

A. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.8 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inch (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

E. Cold-Weather Placement: Comply with ACI 306R and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

F. Hot-Weather Placement: Comply with ACI 301 and ACI 305R and as follows:

1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.9 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.

C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:

1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.10 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Straighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces to receive trowel finish or to be covered with fluid-applied or sheet waterproofing, built up or membrane roofing.

C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and straighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.

2. Finish surfaces to the following tolerances, according to ASTM E1155, for a randomly trafficked floor surface:

a. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.

3. Remedies for out-of-tolerance work:

a. Minimum local values measuring at or above all specified minimum local values F-numbers shall be accepted for tolerance compliance as constructed.

b. Where minimum local values are measured to be below the specified F-numbers one of the following actions shall be performed. In all cases, the particular method of correction shall be determined solely by the Owner.

1) The area within the boundaries of the minimum local area shall be removed and replaced and the area retested per ASTM E1155 to show tolerance compliance.

2) The area within the boundary shall be repaired by grinding or depression-and-retopping of the entire minimum local area and the area retested per ASTM E1155 to show tolerance compliance.

D. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect/Engineer before application.

3.11 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations:

1. Coordinate sizes and locations of concrete bases with actual equipment provided.
2. Construct concrete bases 4 inch (100 mm) high unless otherwise indicated; and extend base not less than 6 inch (150 mm) in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated.
3. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.
4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18 inch (450 mm) centers around the full perimeter of concrete base.
5. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

3.12 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306R for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308R, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12 inch (300 mm) lap over adjacent absorptive covers.
2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inch (300 mm), and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
3. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

4. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
5. Cure concrete surfaces to receive floor coverings with either a moisture cure, a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.

3.13 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.
   1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
   2. Do not apply to concrete that is less than 28 days' old.
   3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

B. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

3.14 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
   1. Defer joint filling until concrete has aged at least one month(s). Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

3.15 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect/Engineer. Remove and replace concrete that cannot be repaired and patched to Architect/Engineer's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
   1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch (13 mm) in any dimension to solid concrete. Limit cut depth to 3/4 inch (19 mm). Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
   2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
   3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect/Engineer.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4 inch (19 mm) clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect/Engineer's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect/Engineer's approval.

3.16 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Inspections:

1. Steel reinforcement placement.
2. Steel reinforcement welding.
3. Headed bolts and studs.
4. Verification of use of required design mixture.
5. Concrete placement, including conveying and depositing.
6. Curing procedures and maintenance of curing temperature.

7. Verification of concrete strength before removal of shores and forms from beams and slabs.

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C172/C172M shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mixture placed each day.

    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C143/C143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.

3. Air Content: ASTM C231/C231M, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

4. Concrete Temperature: ASTM C1064/C1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.

5. Compression Test Specimens: ASTM C31/C31M.

    a. Cast and laboratory cure two sets of two standard 6 inch by 12 inch cylinder specimens for each composite sample or two sets of three standard 4 inch by 8 inch cylinder specimens for each composite sample.

6. Compressive-Strength Tests: ASTM C39/C39M; test one set of laboratory-cured specimens at 7 days and one set of specimens at 28 days.

    a. A compressive-strength test shall be the average compressive strength from a set of two specimens for 6 in by 12 inch cylinders or three specimens for 4 inch by 8 inch cylinders obtained from same composite sample and tested at age indicated.

7. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).

8. Test results shall be reported in writing to Architect/Engineer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

9. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect/Engineer but will not be used as sole basis for approval or rejection of concrete.

10. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect/Engineer. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42 (C42M) or by other methods as directed by Architect/Engineer.

11. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
12. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

D. Measure floor and slab flatness and levelness according to ASTM E1155 within 72 hours of finishing.

3.17 PROTECTION OF LIQUID FLOOR TREATMENTS

A. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

END OF SECTION

.SECTION 06 1000
ROUGH CARPENTRY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Structural dimension lumber framing.

B. Nonstructural dimension lumber framing.

C. Rough opening framing for doors, windows, and roof openings.

D. Sheathing.

E. Subflooring.

F. Underlayment.

G. Preservative treated wood materials.

H. Miscellaneous framing and sheathing.

I. Communications and electrical room mounting boards.

J. Concealed wood blocking, nailers, and supports.

1.2 RELATED REQUIREMENTS

A. Section 03 5400 - Cast Underlayment.

B. Section 06 1800 - Glued-Laminated Construction.

C. Section 09 2116 - Gypsum Board Assemblies: Gypsum-based sheathing.

1.3 REFERENCE STANDARDS

A. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.

B. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.

C. ASTM D3498 - Standard Specification for Adhesives for Field-Gluing Wood Structural Panels (Plywood or Oriented Strand Board) to Wood Based Floor System Framing; 2019a.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

E. AWPA U1 - Use Category System: User Specification for Treated Wood; 2024.

F. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. ICC-ES AC380 - Acceptance Criteria for Termite Physical Barrier Systems; 2021, with Editorial Revision (2022).

H. PS 1 - Structural Plywood; 2023.

I. PS 2 - Performance Standard for Wood Structural Panels; 2018.

J. PS 20 - American Softwood Lumber Standard; 2021.

1.4 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

1.5 WARRANTY

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

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.

1. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
2. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

2.2 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Sizes: Nominal sizes as indicated on drawings, S4S.

B. Moisture Content: S-dry or MC19.

2.3 STRUCTURAL COMPOSITE LUMBER

A. Structural Composite Lumber: Factory fabricated beams, headers, and columns, of sizes and types indicated on drawings; structural capacity as published by manufacturer.

2.4 CONSTRUCTION PANELS

A. Subflooring: Oriented strand board wood structural panel; PS 2, rated Single Floor.

1. Bond Classification: Exterior.
2. Edges: Square.
3. Surface Finish: Fully sanded face.

B. Wall Sheathing: Plywood, PS 1, Grade C-C, Exterior Exposure.

2.5 ACCESSORIES

A. Fasteners and Anchors:

1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere.

B. Joist Hangers: Hot dipped galvanized steel, sized to suit framing conditions.

C. Termite-Resistant Sill Plate Barrier: Self-adhesive, film-backed barrier with release sheet; adheres to concrete substrates and blocks termite access.

1. Thickness: 68 mil, 0.068 inch (1.7 mm).
2. Termite Resistance: 100 percent when tested in accordance with ICC-ES AC380.

D. Subfloor Adhesives: Gap-filling construction adhesive for bonding wood structural panels to wood-based floor system framing; complying with ASTM D3498.

2.6 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.

1. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

B. Preservative Treatment:

1. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.

a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.

b. Treat lumber in contact with masonry or concrete.

PART 3 EXECUTION

3.1 PREPARATION

A. Coordinate installation of rough carpentry members specified in other sections.

3.2 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.3 FRAMING INSTALLATION

A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.

B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.

C. Install structural members full length without splices unless otherwise specifically detailed.

D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes, AWC (WFCM) Wood Frame Construction Manual.

E. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.

F. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

3.4 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

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

C. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

D. Provide the following specific nonstructural framing and blocking:

1. Cabinets and shelf supports.
2. Wall brackets.
3. Towel and bath accessories.
4. Wall-mounted door stops.
5. Wall paneling and trim.
6. Joints of rigid wall coverings that occur between studs.

3.5 INSTALLATION OF CONSTRUCTION PANELS

A. Subflooring/Underlayment Combination: Glue and nail to framing; staples are not permitted.

B. Subflooring: Glue and nail to framing; staples are not permitted.

C. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails, screws, or staples.

D. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches (610 mm) on center on all edges and into studs in field of board.

1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
3. Install adjacent boards without gaps.

3.6 TOLERANCES

A. Framing Members: 1/4 inch (6 mm) from true position, maximum.

B. Variation from Plane, Other than Floors: 1/4 inch in 10 feet (2 mm/m) maximum, and 1/4 inch in 30 feet (7 mm in 10 m) maximum.

3.7 CLEANING

A. Waste Disposal: See Section 01 7419 - Construction Waste Management and Disposal.

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

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

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

END OF SECTION

SECTION 06 2000
FINISH CARPENTRY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Finish carpentry items.

B. Wood door frames, glazed frames.

1.2 RELATED REQUIREMENTS

A. Section 08 1416 - Flush Wood Doors.

1.3 REFERENCE STANDARDS

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

1.4 SUBMITTALS

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

B. Product Data:

1. Provide manufacturer's product data, storage and handling instructions for factory-fabricated units.

C. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.

1. Provide information as required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
2. Include certification program label.

1.5 QUALITY ASSURANCE

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

1. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.

B. Quality Certification:

1. Comply with AWI (QCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section: www.awiqcp.org/#sle.
2. Provide labels or certificates indicating that work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
3. Provide designated labels on shop drawings as required by certification program.
4. Provide designated labels on installed products as required by certification program.
5. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store finish carpentry items under cover, elevated above grade, and in a dry, well-ventilated area not exposed to heat or sunlight.

B. Protect from moisture damage.

C. Handle materials and products to prevent damage to edges, ends, or surfaces.

PART 2 PRODUCTS

2.1 FINISH CARPENTRY ITEMS

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

B. Surface Burning Characteristics: Provide materials having fire and smoke properties as required by applicable code.

C. Interior Woodwork Items:

1. Moldings, Bases, Casings, and Miscellaneous Trim: Clear white pine; prepare for paint or stain finish.

2. Door, Glazed Light, and Pocket Door Frames: White oak; prepare for stained finish.

2.2 ACCESSORIES

A. Wood Filler: Solvent base, tinted to match surface finish color.

2.3 SITE FINISHING MATERIALS

A. Field Finishing: See Section 09 9123.

2.4 FABRICATION

A. Shop assemble work for delivery to site, permitting passage through building openings.

B. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify adequacy of backing and support framing.

3.2 INSTALLATION

A. Install custom fabrications in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.

B. Set and secure materials and components in place, plumb and level.

C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch (0.79 mm). Do not use additional overlay trim to conceal larger gaps.

3.3 PREPARATION FOR SITE FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

3.4 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch (1.6 mm).

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch (0.79 mm).

END OF SECTION

SECTION 06 8316
FIBERGLASS REINFORCED PANELING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fiberglass reinforced plastic panels.

B. Trim.

1.2 REFERENCE STANDARDS

A. 9 CFR 416.2 - Regulatory Requirements Under the Federal Meat Inspection Act and the Poultry Products Inspection Act, Part 416-Sanitation; current edition.

B. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.

C. ASTM D5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels; 2022.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

E. ISO 2812-1 - Paints and Varnishes -- Determination of Resistance to Liquids -- Part 1: Immersion in Liquids Other than Water; 2017.

1.3 SUBMITTALS

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

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Samples: Submit two samples 2 inch by 2 inch in size illustrating material and surface design of panels.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store panels flat, indoors, on a clean, dry surface. Remove packaging and allow panels to acclimate to room temperature for 48 hours prior to installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Fiberglass Reinforced Plastic Panels:

1. Panolam Industries International, Inc: www.panolam.com/#sle.

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

2.2 PANEL SYSTEMS

A. Wall Panels:

1. Panel Size: 4 by 8 feet (1.2 by 2.4 m).

2. Panel Thickness: 0.09 inch (2.3 mm).

3. Surface Design: Embossed.
4. Color: Gray.
5. Attachment Method: Adhesive only, with trim and sealant in joints.

2.3 MATERIALS

A. Panels: Fiberglass reinforced plastic (FRP), complying with ASTM D5319.
   1. Surface Burning Characteristics: Maximum flame spread index of 25 and smoke developed index of 450; when system tested in accordance with ASTM E84.
   2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   3. Sanitation and Cleanability: Comply with 9 CFR 416.2.
   4. Chemical Cleanability: Excellent chemical resistance to common cleaners and detergents when tested in accordance with ISO 2812-1.
B. Trim: Vinyl; color coordinating with panel.
C. Fasteners: Nylon rivets.
D. Adhesive: Type recommended by panel manufacturer.
E. Sealant: Type recommended by panel manufacturer; color matching panel.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions and substrate flatness before starting work.
B. Verify that substrate conditions are ready to receive the work of this section.

3.2 INSTALLATION - WALLS

A. Install panels in accordance with manufacturer's instructions.
B. Cut and drill panels with carbide tipped saw blades, drill bits, or snips.
C. Pre-drill fastener holes in panels, 1/8 inch (3.2 mm) greater in diameter than fastener, spaced as indicated by panel manufacturer.
D. Apply adhesive to the back side of the panel using trowel as recommended by adhesive manufacturer.
E. Apply panels to wall with seams plumb and pattern aligned with adjoining panels.
F. Install panels with manufacturer's recommended gap for panel field and corner joints.
G. Drive fasteners to provide snug fit, and do not over-tighten.
H. Place trim on panel before fastening edges, as required.
I. Fill channels in trim with sealant before attaching to panel.
J. Install trim with adhesive and screws or nails, as required.
K. Seal gaps at floor, ceiling, and between panels with applicable sealant to prevent moisture intrusion.
L. Remove excess sealant after paneling is installed and prior to curing.

END OF SECTION

SECTION 07 2100
THERMAL INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Batt insulation and vapor retarder in exterior wall, ceiling, and roof construction.

B. Batt insulation for filling interior walls.

1.2 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Installation requirements for board insulation over steep slope roof sheathing or roof structure.

1.3 REFERENCE STANDARDS

A. ASTM C240 - Standard Test Methods for Testing Cellular Glass Insulation Block; 2021.

B. ASTM C423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method; 2023.

C. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation; 2022.

D. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).

E. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2023.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

G. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 Degrees C; 2024.

1.4 SUBMITTALS

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

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

1.5 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.1 APPLICATIONS

A. Insulation in Wood Framed Walls: Batt insulation with no vapor retarder.

B. Insulation in Wood Framed Ceiling Structure: Batt insulation with no vapor retarder.

2.2 MINERAL FIBER BLANKET INSULATION MATERIALS

A. Flexible Glass Fiber Blanket Thermal Insulation: Preformed insulation, complying with ASTM C665; friction fit.

1. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.

B. Mineral Fiber Enclosure for Recessed Ceiling Fixtures: Insulated box enclosure with foil facing on exterior side for placement over recessed ceiling light fixture; flame spread index of 25 or less, and smoke development index of 450 or less when tested in accordance with ASTM E84.

1. Light Fixture Size: As indicated on drawings.

2.3 ACCESSORIES

A. Insulation Fasteners: Appropriate for purpose intended.

PART 3 EXECUTION

3.1 EXAMINATION

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

3.2 BATT INSTALLATION

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

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

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

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

3.3 PROTECTION

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

END OF SECTION

SECTION 07 9000
JOINT SEALANTS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior and interior sealants.
2. Joint accessories.

1.2 REFERENCES

A. ASTM International Inc.

1. ASTM C 510 - Standard Test Method for Staining and Color Change of Single- or Multicomponent Joint Sealants.
2. ASTM C 719 - Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle).
3. ASTM C 794 - Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.
4. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants.
5. ASTM C 1193 - Standard Guide for Use of Joint Sealants.
6. ASTM C 1247 - Standard Test Method for Durability of Sealants Exposed to Continuous Immersion in Liquids.
7. ASTM C 1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants.
8. ASTM C 1311 - Standard Specification for Solvent Release Sealants.
9. ASTM D 2203 - Standard Test Method for Staining from Sealants.

1.3 SUBMITTALS

A. Product Data:

1. Materials list of items proposed to be provided under this Section.
2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements.

B. Samples:

1. Submit standard cured color samples for each sealant type illustrating selected colors.
2. Include instructions for removing existing sealants and preparing joints for new sealant.

C. Manufacturer's Certificate:

1. Certify products are suitable for intended use and products meet or exceed specified requirements.
2. Certify applicator is approved by manufacturer.

D. Qualifications Data:

1. Submit applicator's qualifications, including reference projects of similar scope and complexity, with current phone numbers and contact names of architects and owners for verification.

1.4 QUALITY ASSURANCE

A. Perform work in accordance with the following:

1. Building Joints: ASTM C 1193.

1.5 QUALIFICATIONS

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

B. Applicator Qualifications:

1. Company specializing in performing work of this section with minimum three years documented experience, minimum three successfully completed projects of similar scope and complexity, and approved by manufacturer.

2. Designate one individual as project foreman who shall be on site at all times during installation.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in manufacturers unopened original packaging. Inspect for damage.

B. Store primers and sealants in cool dry location with ambient temperature range of 60 to 80 degrees F (15 to 27 degrees C).

1.7 ENVIRONMENTAL REQUIREMENTS

A. Do not install primers or sealants when atmospheric temperatures or joint surface temperatures are less than 40 degrees F (4 degrees C).

1.8 SCHEDULING

A. Ensure sealants are cured before covering with any other materials.

1.9 WARRANTY

A. Submit signed copies of the following warranties against adhesive and cohesive failure of sealant and against infiltration of water and air through sealed joint for period of 3 years from date of completion.

B. Manufacturer's standard warranty covering sealant materials.

C. Applicator's standard warranty covering workmanship.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Tremco Sealant/Weatherproofing Division of RPM International, Inc.

B. Dow Corning Corporation.

C. Sonneborn Building Products Division, Rexnord Chemical Products, Inc. (Master Builders).

D. Approved Equivalent prior to bid.

2.2 SILICONE SEALANTS

A. Single Component Silicone: Dow Corning 795 Silicone Building Sealant (design basis), color as selected, at exterior and interior perimeter of windows.

2.3 POLYURETHANE SEALANTS

A. Single Component Non-Sag Polyurethane: Sonneborn Building Products Sonolastic NP 1 (MasterSeal NP 1) (design basis), color as selected, at locations other than exterior and interior perimeter of windows.

2.4 ACCESSORIES

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

B. Primer: Non-staining type, recommended by sealant manufacturer to suit application.

C. Joint Backing: Closed-cell round foam rod compatible with sealant; oversized 25 to 50 percent larger than joint width; recommended by sealant manufacturer to suit application

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

E. Masking tape: Non-staining, non-absorbent tape product compatible with joint sealants and adjacent joint surfaces.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify substrate surfaces and joint openings are ready to receive work.

1. Verify joint surfaces are clean and dry.
2. Ensure concrete surfaces are fully cured.

B. Report unsatisfactory conditions in writing to the Architect;

C. Do not proceed until unsatisfactory conditions are corrected.

3.2 PREPARATION

A. Prepare joints in accordance with ASTM C 1193 and manufacturer's instructions.

B. Clean joint surfaces to remove dirt, dust, oils, wax, paints, and other contamination capable of affecting primer and sealant bond.

C. Protect elements surrounding the Work of this section from damage or disfiguration. Apply masking tape to adjacent surfaces when required to prevent damage to finishes from sealant installation.

3.3 EXISTING WORK

A. Mechanically remove existing sealant.

B. Clean joint surfaces of residual sealant and other contaminates capable of affecting sealant bond to joint surface.

C. Allow joint surfaces to dry before installing new sealants.

3.4 SEALANT INSTALLATION

A. Install primer and sealants in accordance with ASTM C 1193 and manufacturer's instructions.

B. Install joint backing to maintain the following joint ratios:

1. Joints up to 1/2 inch (13 mm) Wide: 1:1 width to depth ratio.
2. Joints Greater than 1/2 inch (13 mm) Wide: 2:1 width to depth ratio; maximum 1/2 inch joint depth.

C. Install bond breaker where joint backing is not used.

D. Apply primer where required for sealant adhesion.

E. Install sealants immediately after joint preparation.

F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

G. Joining Silicone and Polyurethane Sealants:

1. Install polyurethane sealants first.
2. Join silicone sealant to polyurethane in accordance with manufacturer's instructions.

H. Tool exposed joint surface concave.

3.5 CLEANING

A. Remove masking tape.

B. Clean adjacent surfaces soiled by sealant installation.

END OF SECTION

SECTION 08 1416
FLUSH WOOD DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

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

1.2 RELATED REQUIREMENTS

A. Section 06 2000 - Finish Carpentry: Wood door frames.

B. Section 08 7100 - Door Hardware.

1.3 REFERENCE STANDARDS

A. AWI (QCP) - Quality Certification Program; Current Edition.

B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).

C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

D. WDMA I.S. 1A - Interior Architectural Wood Flush Doors; 2021, with Errata (2022).

1.4 SUBMITTALS

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

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

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

1. Provide information as required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).

D. Samples: Submit two samples of door veneer, 3 by 6 inches (76 by 152 mm) in size illustrating wood grain, stain color, and sheen.

E. Specimen warranty.

F. Warranty, executed in Owner's name.

1.5 DELIVERY, STORAGE, AND HANDLING

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

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

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

1.6 WARRANTY

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

B. Manufacturer Warranty: Provide manufacturer's warranty on interior doors for the life of the installation. Complete forms in Owner's name and register with manufacturer.

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

PART 2 PRODUCTS

2.1 DOORS AND PANELS

A. Doors: See drawings for locations and additional requirements.

1. Quality Standard: Custom Grade, Heavy Duty performance, in accordance with AWI/AWMAC/WI (AWS), AWMAC/WI (NAAWS) or WDMA I.S. 1A.
2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.

B. Interior Doors: 1-3/4 inches (44 mm) thick unless otherwise indicated; flush construction.

1. Provide solid core doors at each location.
2. Wood veneer facing for field stain finish.

2.2 DOOR AND PANEL CORES

A. Non-Rated Solid Core and 20 Minute Rated Doors: Type structural composite lumber core (SCLC), plies and faces as indicated.

2.3 DOOR FACINGS

A. Veneer Facing for Transparent Finish: White oak, HPVA Grade A, plain sliced (flat cut), with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.

1. Vertical Edges: Any option allowed by quality standard for grade.
2. Room Match: Match door faces within each separate room or area of building. Corridor door faces do not need to match where they are separated by 10 feet (3 m) or more.

B. Facing Adhesive: Type I - waterproof.

2.4 DOOR CONSTRUCTION

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

B. Cores Constructed with stiles and rails:

1. Provide solid blocks at lock edge for hardware reinforcement.
2. Provide solid blocking for other through bolted hardware.

C. Glazed Openings: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.

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

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

1. Exception: Doors to be field finished.

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

2.5 FINISHES - WOOD VENEER DOORS

A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:

1. Transparent:

a. System - 11, Polyurethane, Catalyzed.

b. Stain: As selected to match existing by Architect/Engineer.

c. Sheen: Satin.

B. Factory finish doors in accordance with approved sample.

2.6 ACCESSORIES

A. Wood Door Frames: See Section 06 2000.

B. Door Window Frames: Door window frames with glazing securely fastened within door opening.

1. Glazing: 1/4 inch (6.4 mm) thick, tempered glass, in compliance with requirements of authorities having jurisdiction.

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

D. Door Hardware: See Section 08 7100.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

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

3.2 INSTALLATION

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

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

C. Field-Finished Doors: Trimming to fit is acceptable.

1. Adjust width of non-rated doors by cutting equally on both jamb edges.

2. Trim maximum of 3/4 inch (19 mm) off bottom edges.

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

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

F. Coordinate installation of glazing.

3.3 TOLERANCES

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

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

3.4 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

C. Operation: Rehang or replace doors that do not swing freely.

D. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION

SECTION 08 7100
DOOR HARDWARE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes commercial door hardware for the following:

1. Swinging doors.

B. Door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical door hardware.
3. Automatic operators.
4. Cylinders specified for doors in other sections.

C. Related Sections:

1. Division 08 Section “Hollow Metal Doors and Frames”.
2. Division 08 Section “Flush Wood Doors”.
3. Division 08 Section “Aluminum-Framed Entrances and Storefronts”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. UL/ULC and CSA C22.2 - Standards for Automatic Door Operators Used on Fire and Smoke Barrier Doors and Systems of Doors.
8. State Building Codes, Local Amendments.

E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:

1. ANSI/BHMA Certified Product Standards - A156 Series.
2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
3. ANSI/UL 294 - Access Control System Units.
4. UL 305 - Panic Hardware.
5. ANSI/UL 437- Key Locks.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing, fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."

2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.

3. Content: Include the following information:

a. Type, style, function, size, label, hand, and finish of each door hardware item.

b. Manufacturer of each item.

c. Fastenings and other pertinent information.

d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.

e. Explanation of abbreviations, symbols, and codes contained in schedule.

f. Mounting locations for door hardware.

g. Door and frame sizes and materials.

h. Warranty information for each product.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Shop Drawings: Details of electrified access control hardware indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:

a. Elevation diagram of each unique access-controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.

b. Complete (risers, point-to-point) access control system block wiring diagrams.

c. Wiring instructions for each electronic component scheduled herein.

2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

E. Informational Submittals:

1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

F. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.

1.4 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).

C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

E. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.

1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.

2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

F. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.

G. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:

1. Function of building, purpose of each area and degree of security required.

2. Plans for existing and future key system expansion.

3. Requirements for key control storage and software.

4. Installation of permanent keys, cylinder cores and software.

5. Address and requirements for delivery of keys.

H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access-controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

I. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.

B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.

C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
2. Faulty operation of the hardware.
3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
4. Electrical component defects and failures within the systems operation.

C. Warranty Period: Unless otherwise indicated, warranty shall be one year from date of Substantial Completion.

PART 2 PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

C. Please note that ASSA ABLOY is transitioning the Yale Commercial brand to ASSA ABLOY ACCENTRA. This affects only the brand name; the products and product numbers will remain unchanged. The brand transition is expected to be complete in or about May of 2024, and products shipping after that time will be branded ASSA ABLOY ACCENTRA.

D. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 BUTT HINGES

A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.

1. Quantity: Provide the following hinge quantity:

a. Two Hinges: For doors with heights up to 60 inches.

b. Three Hinges: For doors with heights 61 to 90 inches.

c. Four Hinges: For doors with heights 91 to 120 inches.

d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
   a. Widths up to 3’0”: 4-1/2” standard or heavy weight as specified.
   b. Sizes from 3’1” to 4’0”: 5” standard or heavy weight as specified.
3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
   a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
   b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
4. Hinge Options: Comply with the following:
   a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.
5. Manufacturers:
   a. McKinney (MK) - TA/T4A Series, 5-knuckle.
   b. Dormakaba Best (ST) - F/FBB Series, 5-knuckle.

2.3 CONTINUOUS HINGES

A. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 continuous geared hinge. with minimum 0.120-inch thick extruded 6063-T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.
   1. Manufacturers:.
      a. Pemko (PE).
      b. Dormakaba Best (ST).

2.4 POWER TRANSFER DEVICES

A. Concealed Quick Connect Electric Power Transfers: Provide concealed wiring pathway housing mortised into the door and frame for low voltage electrified door hardware. Furnish with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.
   1. Manufacturers:
      a. Pemko (PE) - EL-CEPT Series.
      b. Securitron (SU) - EL-CEPT Series.

B. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.

1. Provide one each of the following tools as part of the base bid contract:
    a. McKinney (MK) - Electrical Connecting Kit: QC-R001.
    b. McKinney (MK) - Connector Hand Tool: QC-R003.
2. Manufacturers:
    a. McKinney (MK) - QC-C Series.

2.5 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: Provide products conforming to ANSI/BHMA A156.3 and A156.16, Grade 1.

1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
2. Furnish dust proof strikes for bottom bolts.
3. Surface bolts to be minimum 8” in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
5. Manufacturers:
    a. Rockwood (RO).
    b. Trimco (TC).

B. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.

1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
4. Pulls, where applicable, shall be provided with a 10” clearance from the finished floor on the push side to accommodate wheelchair accessibility.
5. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.
6. Manufacturers:
    a. Rockwood (RO).

b. Trimco (TC).

2.6 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years' experience designing secured master key systems and have on record a published security keying system policy.

B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:

1. Threaded mortise cylinders with rings and cams to suit hardware application.
2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
4. Tubular deadlocks and other auxiliary locks.
5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
6. Keyway: Match Facility Standard.
7. Provided LFIC cores.
8. Provided one (1) each additional LFIC core per each lockset for attic stock

C. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Keys (where required): Ten (10).

D. Construction Keying: Provide construction master keyed cylinders.

E. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

2.7 KEY CONTROL

A. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.

1. Manufacturers:

a. Lund Equipment (LU).

b. MMF Industries (MM).

c. Telkee (TK).

2.8 MORTISE LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Grade 1 (Heavy Duty): Provide ANSI/BHMA A156.13, Series 1000, Operational Grade 1 Certified Products Directory (CPD) listed mortise locksets. Listed manufacturers shall meet all functions and features as specified herein.

1. Manufacturers:

a. Corbin Russwin Hardware (RU) - ML2000 Series.

b. No Substitution – Facility Standard.

2.9 CYLINDRICAL LOCKS AND LATCHING DEVICES

A. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Operational Grade 1 Certified Products Directory (CPD) listed cylindrical locksets. Listed manufacturers shall meet all functions and features as specified herein.

1. Manufacturers:

a. Corbin Russwin Hardware (RU) - CLX3300 Series.

b. No Substitution – Facility Standard.

2.10 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.11 ELECTRIC STRIKES

A. Standard Electric Strikes: Electric strikes conforming to ANSI/BHMA A156.31, Grade 1, for use on non-rated or fire rated openings. Strikes shall be of stainless steel construction tested to a minimum of 1500 pounds of static strength and 70 foot-pounds of dynamic strength with a minimum endurance of 1 million operating cycles. Provide strikes with 12 or 24 VDC capability, fail-secure unless otherwise specified. Where specified provide latchbolt and latchbolt strike monitoring indicating both the position of the latchbolt and locked condition of the strike.

1. Manufacturers:

a. HES (HS) - 1500/1600 Series.

B. Provide electric strikes with in-line power controller and surge suppressor by the same manufacturer as the strike with the combined products having a five year warranty.

2.12 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. Exit devices shall have a five-year warranty.
2. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
3. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer’s catalog and template book for specific requirements.
4. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
5. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
    a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
    b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.
7. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2” wide stiles.
9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
10. Rail Sizing: Provide exit device rails factory sized for proper door width application.
11. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed exit devices. Listed manufacturers shall meet all functions and features as specified herein.

1. Electromechanical exit devices shall have the following functions and features:
    a. Universal Molex plug-in connectors that have standardized color-coded wiring and are field configurable in fail safe or fail secure and operate from 12vdc to 24vdc regulated.
    b. EcoFlex or equivalent technology that reduces energy consumption up to 92% as certified by GreenCircle.

c. Options to be available for request-to-exit or enter signaling, latchbolt and touchbar monitoring.

d. Field configurable electrified trim to fail-safe or fail-secure that operates from 12-24VDC.

e. Five-year limited warranty for electromechanical features.

2. Manufacturers:

a. Sargent Manufacturing (SA) - 80 Series.

b. Corbin Russwin (RU) – ED5000 Series.

c. Von Duprin (VD) – 99 Series.

2.13 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:

1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.

2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.

3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.

4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.

5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.

6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.

B. Door Closers, Surface Mounted (Large Body Cast Iron): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control.

1. Large body cast iron surface mounted door closers shall have a 30-year warranty.

2. Manufacturers:

a. Sargent Manufacturing (SA) – 281 Series.

b. Corbin Russwin (RU) – DC8000 Series.

c. LCN (LC) – 4040XP Series.

2.14 ELECTROHYDRAULIC DOOR OPERATORS

A. Electrohydraulic Door Operators (High Traffic): Provide ANSI/BHMA A156.19 Certified Products Directory (CPD) listed low energy operators that meet ANSI/BHMA A156.4 requirements and are UL listed for use on fire rated doors and UL10C certified that comply with requirements for the Americans with Disabilities Act (ADA). Operators shall be verified by GreenCircle to offer energy savings of 19% when compared to similar products to accommodate openings up 250 pounds and 48” wide.

1. Provide operators with features as follows:

a. Non-handed with push and pull side mounting.

b. Operates as mechanical surface closer during close cycles, when door is opened manually or if power is off.

c. Activation by push button, hands-free or radio frequency devices.

d. On board electronics to collect usage and cycle count data to facilitate preventative maintenance/diagnostics.

e. Two-year limited warranty.

f. Wi-Fi interface.

g. Mounting backplate to simplify and speed up installation.

2. Operators shall have the following functionality:

a. Adjustable Hold Open: Amount of time a door will stay in the full open position after an activation.

b. Blow Open for Smoke Ventilation: Door opens when signal is received from alarm system allowing air or smoke to flow through opening. Door will stay open until signal from alarm system is stopped.

c. Infinite Hold Open: Door will hold open at set position until power is turned off.

d. Obstruction Detection: Door closes if it hits an obstruction while opening; door will reverse to open position if it hits an obstruction while closing. Door will stop once it hits an obstruction and will rest against the obstruction until removed.

e. Open Delay: Delays operator opening for locking hardware.

f. Overload Safety Shut-Off: After two minutes of receiving a door activation signal, inverter times out and door closes to prevent motor/inverter damage.

g. Presence Detector Input: Input for external sensor to detect presence at door open or close position only.

h. Push & Go: As the door is manually opened, the operator "senses" movement and opens door to the full-open position.

i. Selector Mode Switch: Off disables the signal inputs unless Blow Open is activated, on activates the signal inputs, hold open activates the unit (unless Blow Closed is activated) to the hold open position.

j. Vestibule Delay: When the wall switch is pressed, first door in vestibule will open. Second door will open once vestibule door delay has expired. Delay is adjustable.

3. Manufacturers:
    a. Norton Rixson (NO) - 6000 Series.
    b. LCN (LC) – 4600 Series.

2.15 SURFACE MOUNTED CLOSER HOLDERS

A. Closer Holder Release Devices: ANSI A156.15 certified closer holder release devices designed to hold open fire or smoke rated doors until interruption of signal from fire alarm, smoke detector or remote release switch. Pull side, push side, or double egress mounting applications available with non-handed track and closer body and dual voltage input (24V/120V). Voltage to be 24VDC unless otherwise specified. Where optional detector is required, provide integral photo electric type with LED indicator. Auxiliary door stops are required at hold open point.
    1. Manufacturers:
        a. Norton Rixson (NO) - 7700PT(D) Series.
        b. Sargent Manufacturing (SA) -351 EHT(D) Series.

2.16 ARCHITECTURAL TRIM

A. Door Protective Trim
    1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
    2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1” LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
    3. Where plates are applied to fire rated doors with the top of the plate more than 16” above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer’s catalog and template book for specific requirements for size and applications.
    4. Protection Plates: ANSI/BHMA A156.6 protection plates (kick, armor, or mop), fabricated from the following:
        a. Stainless Steel: 300 grade, 050-inch thick.
    5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
    6. Manufacturers:
        a. Rockwood (RO).
        b. Trimco (TC).

2.17 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.

B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.

1. Manufacturers:

a. Rockwood (RO).

b. Trimco (TC).

C. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

1. Manufacturers:

a. Norton Rixson (RF).

b. Sargent Manufacturing (SA).

2.18 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.

B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.

1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.

C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.

1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NPFA 252, Standard Methods of Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.

E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

F. Manufacturers:

1. Pemko (PE).

2. Reese Enterprises, Inc. (RE).

2.19 ELECTRONIC ACCESSORIES

A. Door Position Switches: Door position magnetic reed contact switches specifically designed for use in commercial door applications. On recessed models the contact and magnetic housing snap-lock into a 1" diameter hole. Surface mounted models include wide gap distance design complete with armored flex cabling. Provide SPDT, N/O switches with optional Rare Earth Magnet installation on steel doors with flush top channels.

1. Manufacturers:

a. Sargent Manufacturing (SA) - 3280 Series.

b. Securitron (SU) - DPS Series.

2.20 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.21 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware

C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.

B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.

B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. DHI TDH-007-20: Installation Guide for Doors and Hardware.
3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

A. Field Inspection (Punch Report): Reference Division 01 Sections “Closeout Procedures”. Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.

1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by door hardware installation.

C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.
2. The supplier is responsible for handing and sizing all products.
3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

B. Manufacturer’s Abbreviations:

1. MK - McKinney
2. PE - Pemko
3. SU - Securitron
4. RO - Rockwood
5. SA - SARGENT
6. RU - Corbin Russwin
7. YA - ASSA ABLOY ACCENTRA, formerly known as Yale
8. HS - HES
9. RF - Rixson
10. NO - Norton
11. OT - Other
12. RE - Reese Enterprises Inc

HARDWARE SETS

Set: 1.0

Doors: 104, 105

3	Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Office Lock	10 8205 LNJ	US26D	SA
1	Surf Overhead Stop	9-x36	630	RF
1	Kick Plate	K1050 10" x 2" LDW BEV CSK	US32D	RO

Set: 2.0

Doors: 101, 103A, 103B,

3	Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Office Lock	10 8205 LNJ	US26D	SA
1	Surface Closer	281 P10	EN	SA
1	Kick Plate	K1050 10" x 2" LDW BEV CSK	US32D	RO
1	Door Stop & Holder (Wall)	494	US26D	RO

Set: 3.0

Doors: 101.1, 102, 103.1

3	Hinge, Full Mortise	TA2714 4-1/2" x 4-1/2"	US26D	MK
1	Storeroom Lock	10 8204 LNJ	US26D	SA
1	Kick Plate	K1050 10" x 2" LDW BEV CSK	US32D	RO
1	Door Stop & Holder (Wall)	494	US26D	RO

END OF SECTION

SECTION 09 0561
COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. This section applies to floors identified in Contract Documents that are receiving the following types of floor coverings:

B. Patching compound.

C. Remedial floor coatings.

1.2 REFERENCE STANDARDS

A. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 50 mm [2 in.] Cube Specimens); 2023.

B. ASTM C472 - Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters, and Gypsum Concrete; 2020.

C. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordinate scheduling of cleaning and testing, so that preliminary cleaning has been completed for at least 24 hours prior to testing.

1.4 SUBMITTALS

A. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:

1. Moisture and alkalinity (pH) limits and test methods.
2. Manufacturer's required bond/compatibility test procedure.

B. Remedial Materials Product Data: Manufacturer's published data on each product to be used for remediation.

1. Test reports indicating compliance with specified performance requirements, performed by nationally recognized independent testing agency.

C. Testing Agency's Report:

1. Description of areas tested; include floor plans and photographs if helpful.
2. Summary of conditions encountered.
3. Moisture and alkalinity (pH) test reports.
4. Copies of specified test methods.
5. Recommendations for remediation of unsatisfactory surfaces.
6. Product data for recommended remedial coating.
7. Submit report to Architect/Engineer.
8. Submit report not more than two business days after conclusion of testing.

D. Adhesive Bond and Compatibility Test Report.

1.5 QUALITY ASSURANCE

A. Moisture and alkalinity (pH) testing shall be performed by an independent testing agency employed and paid by Contractor.

B. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.

1. Submit evidence of experience consisting of at least 3 test reports of the type required, with project Owner's project contact information.

C. Contractor's Responsibility Relating to Independent Agency Testing:

1. Provide access for and cooperate with testing agency.
2. Confirm date of start of testing at least 10 days prior to actual start.
3. Allow at least 4 business days on site for testing agency activities.
4. Achieve and maintain specified ambient conditions.
5. Notify Architect/Engineer when specified ambient conditions have been achieved and when testing will start.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, handle, and protect products in accordance with manufacturer’s instructions and recommendations.

B. Deliver materials in manufacturer’s packaging; include installation instructions.

C. Keep materials from freezing.

1.7 FIELD CONDITIONS

A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F (18 degrees C) or more than 85 degrees F (30 degrees C).

B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

PART 2 PRODUCTS

2.1 MATERIALS

A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:

1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
2. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.

B. Remedial Floor Coating: Single- or multi-layer coating or coating/overlay combination intended by its manufacturer to resist water vapor transmission to degree sufficient to meet flooring manufacturer's emission limits, resistant to the level of alkalinity (pH) found, and suitable for adhesion of flooring without further treatment.

PART 3 EXECUTION

3.1 CONCRETE SLAB PREPARATION

A. Perform following operations in the order indicated:

1. Preliminary cleaning.
2. Specified remediation, if required.
3. Patching, smoothing, and leveling, as required.
4. Other preparation specified.
5. Adhesive bond and compatibility test.
6. Protection.

3.2 PRELIMINARY CLEANING

A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.

B. Do not use solvents or other chemicals for cleaning.

3.3 INTERNAL RELATIVE HUMIDITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Where this specification conflicts with the referenced test method, comply with the requirements of this section.

C. Test in accordance with ASTM F2170 Procedure A and as follows.

D. Testing with electrical impedance or resistance apparatus may not be substituted for the specified ASTM test method, as the values determined are not comparable to the ASTM test values and do not quantify the moisture content sufficiently.

E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if any test value exceeds 75 percent relative humidity.

F. Report: Report the information required by the test method.

3.4 ALKALINITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if alkalinity (pH) test value is over 10.

3.5 PREPARATION

A. See individual floor covering section(s) for additional requirements.

B. Comply with requirements and recommendations of floor covering manufacturer.

C. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.

D. Do not fill expansion joints, isolation joints, or other moving joints.

3.6 ADHESIVE BOND AND COMPATIBILITY TESTING

A. Comply with requirements and recommendations of floor covering manufacturer.

3.7 APPLICATION OF REMEDIAL FLOOR COATING

A. Comply with requirements and recommendations of coating manufacturer.

3.8 APPLICATION OF REMEDIAL FLOOR TREATMENT

A. Comply with requirements and recommendations of treatment manufacturer.

3.9 PROTECTION

A. Cover prepared floors with building paper or other durable covering.

END OF SECTION

SECTION 09 2116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.

B. Acoustic insulation.

C. Gypsum sheathing.

D. Gypsum wallboard.

E. Joint treatment and accessories.

F. Textured finish system.

1.2 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.

1.3 REFERENCE STANDARDS

A. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017 (Reapproved 2022).

B. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2023.

C. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2019.

D. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.

E. ASTM C1629/C1629M - Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels; 2023.

F. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2021.

G. GA-216 - Application and Finishing of Gypsum Panel Products; 2021.

1.4 SUBMITTALS

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

B. Product Data:

1. Provide data on gypsum board, accessories, and joint finishing system.

2. Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store gypsum products and accessories indoors and keep above freezing. Elevate boards above floor, on nonwicking supports, in accordance with manufacturer's recommendations.

B. Store metal products to prevent corrosion.

PART 2 PRODUCTS

2.1 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.

1. See PART 3 for finishing requirements.

2.2 BOARD MATERIALS

A. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.

1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   a. Mold resistant board is required at all locations.
3. Thickness:
   a. Vertical Surfaces: 5/8 inch (16 mm).
   b. Ceilings: 5/8 inch (16 mm).
4. Mold-Resistant, Paper-Faced Products:
   a. American Gypsum Company; M-Bloc Type X: www.americangypsum.com/#sle.
   b. CertainTeed Corporation; M2Tech 5/8" Type X Moisture & Mold Resistant Drywall: www.certainteed.com/#sle.
   c. Georgia-Pacific Gypsum; ToughRock Fireguard X Mold-Guard: www.gpgypsum.com/#sle.
   d. USG Corporation; Sheetrock Brand EcoSmart Panels Mold Tough Firecode X 5/8 in. (15.9 mm): www.usg.com/#sle.
   e. Substitutions: See Section 01 6000 - Product Requirements.

B. Abuse Resistant Wallboard:

1. Application: High-traffic areas indicated.
2. Indentation: Level 1, minimum, when tested in accordance with ASTM C1629/C1629M.
3. Soft Body Impact: Level 1, minimum, when tested in accordance with ASTM C1629/C1629M.
4. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
5. Type: Fire-resistance-rated Type X, UL or WH listed.
6. Thickness: 5/8 inch (16 mm).
7. Edges: Tapered.

2.3 GYPSUM BOARD ACCESSORIES

A. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.

B. Beads, Joint Accessories, and Other Trim: ASTM C1047, rigid plastic, galvanized steel, or rolled zinc, unless noted otherwise.

1. Corner Beads: Low profile, for 90 degree outside corners.

2. Expansion Joints:

    a. Type: V-shaped metal with factory-installed protective tape.

C. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.

D. Abuse Resistant Finishes:

1. Acrylic, water-based, non-textured, high build, tintable primer and surfacer.

E. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

F. Partition Closures: Aluminum system to fill the gap between the end of an interior partition and window mullion or glass designed to limit sound transmission between adjacent rooms.

1. System Components: Provide all components and accessories needed to meet system requirements, including, but not limited to, wall end caps, sealants, compressible foam, and acoustic batts.

2. Angled intersections: Where partitions are not perpendicular to exterior walls, provide custom components as needed to accommodate the angle of the partition.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.2 FRAMING INSTALLATION

A. Studs: Space studs at 16 inches on center (at 406 mm on center).

1. Extend partition framing as noted on drawings.

2. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs with continuous bridging.

B. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

C. Blocking: Install wood blocking for support of:

1. Framed openings.

2. Toilet accessories.

3. Wall-mounted door hardware.

3.3 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Acoustic Sealant: Install in accordance with manufacturer's instructions.

1. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.

3.4 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.

C. Fire-Resistance-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

D. Exposed Gypsum Board in Interior Wet Areas: Seal joints, cut edges, and holes with water-resistant sealant.

E. Installation on Wood Framing: For rated assemblies, comply with requirements of listing authority. For nonrated assemblies, install as follows:

1. Single-Layer Applications: Screw attachment.

3.5 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.

1. Space control joints in accordance with ASTM C840 at specific locations indicated on drawings or approved by Architect.

B. Corner Beads: Install at external corners, using longest practical lengths.

3.6 JOINT TREATMENT

A. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:

1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.

2. Level 1: Fire-resistance-rated wall areas above finished ceilings, whether or not accessible in the completed construction.

B. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.

1. Feather coats of joint compound so that camber is maximum 1/32 inch (0.8 mm).

3.7 TEXTURE FINISH

A. Apply finish texture coating by means of spraying apparatus in accordance with manufacturer's instructions and to match approved sample.

3.8 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet (3 mm in 3 m) in any direction.

3.9 PROTECTION

A. Protect installed gypsum board assemblies from subsequent construction operations.

END OF SECTION

SECTION 09 6500
RESILIENT FLOORING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Resilient base.

B. Installation accessories.

1.2 RELATED REQUIREMENTS

A. Section 09 0561 - Common Work Results for Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation.

1.3 REFERENCE STANDARDS

A. ASTM F1861 - Standard Specification for Resilient Wall Base; 2021.

1.4 SUBMITTALS

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

B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

C. Selection Samples: Submit manufacturer's complete set of color samples for Architect/Engineer's initial selection.

D. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

C. Maintain temperature in storage area between 55 degrees F (13 degrees C) and 90 degrees F (72 degrees C).

D. Do not double stack pallets.

1.6 FIELD CONDITIONS

A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F (21 degrees C) to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F (13 degrees C).

PART 2 PRODUCTS

2.1 RESILIENT BASE

A. Resilient Base - Type WB-1: ASTM F1861, Type TS, rubber, vulcanized thermoset; style as scheduled.

1. Manufacturers:

a. Johnsonite, a Tarkett Company: www.johnsonite.com/#sle.

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

2. Height: 4 inches (100 mm).
3. Thickness: 0.125 inch (3.2 mm).
4. Finish: Satin.
5. Length: Roll.
6. Color: To be selected by Architect/Engineer from manufacturer's full range.

2.2 ACCESSORIES

A. Moldings, Transition and Edge Strips: Rubber/Vinyl.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).

1. Test in accordance with Section 09 0561.
2. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

3.2 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

B. Clean substrate.

C. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.

3.3 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

3.4 INSTALLATION - RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches (45 mm) between joints.

B. Miter internal corners. At external corners, 'V' cut back of base strip to 2/3 of its thickness and fold. At exposed ends, use premolded units.

C. Install base on solid backing. Bond tightly to wall and floor surfaces.

D. Scribe and fit to door frames and other interruptions.

3.5 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

3.6 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION

SECTION 09 6700
FLUID-APPLIED FLOORING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fluid-applied flooring and base.

1.2 RELATED REQUIREMENTS

A. Section 09 0561 - Common Work Results for Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation.

B. Section 09 0561 - Common Work Results for Flooring Preparation: Concrete slab moisture and alkalinity testing and remediation procedures.

1.3 REFERENCE STANDARDS

A. ASTM D570 - Standard Test Method for Water Absorption of Plastics; 2022.

B. ASTM D638 - Standard Test Method for Tensile Properties of Plastics; 2022.

C. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics; 2023.

D. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2022.

E. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2019a.

1.4 SUBMITTALS

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

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns and colors available.

C. Samples: Submit two samples, 4 x 4 inch in size illustrating color and pattern for each floor material for each color specified.

D. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports.

E. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention, and application rate for each coat.

F. Maintenance Data: Include maintenance procedures, recommended maintenance materials, procedures for stain removal, repairing surface, and suggested schedule for cleaning.

1.5 QUALITY ASSURANCE

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

B. Applicator Qualifications: Company specializing in performing the work of this section.

1. Approved by manufacturer.

1.6 MOCK-UPS

A. Construct mock-up(s) of fluid applied flooring to serve as basis for evaluation of texture and workmanship.
   1. Number of Mock-Ups to be Prepared: One.
   2. Use same materials and methods for use in the work.
   3. Locate where directed.
   4. Minimum Size: 48 inches by 48 inches (1220 mm by 1220 mm).

B. Obtain approval of mock-up by Architect/Engineer before proceeding with work.

C. Approved mock-up may not remain as part of the work.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store resin materials in a dry, secure area.

1.8 FIELD CONDITIONS

A. Maintain minimum temperature in storage area of 55 degrees F (13 degrees C).

B. Store materials in area of installation for minimum period of 24 hours prior to installation.

C. Maintain ambient temperature required by manufacturer 72 hours prior to, during, and 24 hours after installation of materials.

PART 2 PRODUCTS

2.1 FLUID-APPLIED FLOORING SYSTEMS

A. Fluid-Applied Flooring Type EF-1: Epoxy base coat(s), with broadcast aggregate.
   1. Product: Deco-Fleck manufactured by Tnemec.
      a. Provide manufacturer's total number of coats for assembly in order to achieve the listed thickness, layers and texture as recommended by manufacturer.
   2. Texture: Slip resistant.
   3. Sheen: High gloss.
   4. Layers:
      a. Primer/Moisture mitigation: Tnemec as recommended for this installation
      b. Intermediate Coat: Series N224, broadcast to refusal.
      c. Topcoat: Series N284 Deco-Clear. Thickness and number of coats will vary depending on the amount broadcast and desired finish.
      d. Finish Coat: Series 248 Everthane
   5. Flake size: 1/16 inch
   6. Color: Creek Bed.
   7. Substitutions: See Section 01 6000-Product Requirements.

2.2 ACCESSORIES

A. Subfloor Filler: Type recommended by fluid-applied flooring manufacturer.

B. Primer: Type recommended by fluid-applied flooring manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive flooring.

B. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of materials to subfloor surfaces.

C. Cementitious Subfloor Surfaces: Verify that substrates are ready for fluid-applied flooring installation by testing for moisture and alkalinity (pH).

1. Test in accordance with Section 09 0561.
2. Obtain instructions if test results are not within limits recommended by fluid-applied flooring manufacturer.
3. Follow moisture and alkalinity remediation procedures in Section 09 0561.

D. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

A. Remove subfloor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with subfloor filler.

B. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Grind irregularities above the surface level. Prohibit traffic until filler is cured.

C. Vacuum clean substrate.

D. Apply primer to surfaces required by flooring manufacturer.

3.3 INSTALLATION - FLOORING

A. Apply in accordance with manufacturer's instructions.

B. Apply each coat to minimum thickness required by manufacturer.

C. Finish to smooth level surface.

3.4 PROTECTION

A. Prohibit traffic on floor finish for 48 hours after installation.

B. Barricade area to protect flooring until fully cured.

END OF SECTION

SECTION 09 9123
INTERIOR PAINTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.

1. Mechanical and Electrical:

a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.

b. In finished areas, paint shop-primed items.

D. Do Not Paint or Finish the Following Items:

1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.

2. Items indicated to receive other finishes.

3. Items indicated to remain unfinished.

4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.

5. Floors, unless specifically indicated.

6. Glass.

7. Concealed pipes, ducts, and conduits.

1.2 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.

1.3 REFERENCE STANDARDS

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

B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2024.

C. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2020.

D. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; Current Edition.

E. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

F. SSPC-SP 1 - Solvent Cleaning; 2015, with Editorial Revision (2016).

G. SSPC-SP 6/NACE No.3 - Commercial Blast Cleaning; 2006.

1.4 SUBMITTALS

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

B. Product Data: Provide complete list of products to be used, with the following information for each:

1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").

2. MPI product number (e.g., MPI #47).

3. Cross-reference to specified paint system products to be used in project; include description of each system.

C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches (216 by 279 mm) in size, illustrating range of colors available for each finishing product specified.

1. Where sheen is specified, submit samples in only that sheen.

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

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.6 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Provide lighting level of 80 fc (860 lux) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide paints and finishes from the same manufacturer to the greatest extent possible.

B. Paints:

1. Sherwin-Williams Company: www.sherwin-williams.com/#sle.

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

2.2 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.

1. Where MPI paint numbers are specified, provide products listed in Master Painters Institute Approved Product List, current edition available at www.paintinfo.com, for specified MPI categories, except as otherwise indicated.

2. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
3. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
4. Supply each paint material in quantity required to complete entire project's work from a single production run.
5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content:

1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
   a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
   b. Architectural coatings VOC limits of the State in which the Project is located.
2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

C. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect/Engineer from the manufacturer's full line.

D. Colors: As indicated on drawings.

1. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling under which they are mounted.

2.3 PAINT SYSTEMS - INTERIOR

A. Paint I-OP - Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, concrete, concrete masonry units, brick, wood, plaster, uncoated steel, shop primed steel, galvanized steel, aluminum, and acoustical ceilings.

1. Two top coats and one coat primer.
2. Primer: As recommended by top coat manufacturer for specific substrate.

B. Wood, Opaque, Latex, 3 Coat:

1. One coat of latex primer sealer.
2. Semi-gloss: Two coats of latex enamel.
3. Eggshell: Two coats of latex enamel.

C. Gypsum Board/Plaster, Latex, 3 Coat:

1. One coat of alkyd primer sealer.
2. Semi-gloss: Two coats of latex enamel.
3. Eggshell: Two coats of latex enamel.

2.4 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

C. Test shop-applied primer for compatibility with subsequent cover materials.

D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:

1. Gypsum Wallboard: 12 percent.
2. Plaster and Stucco: 12 percent.
3. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
4. Interior Wood: 15 percent, measured in accordance with ASTM D4442.

3.2 PREPARATION

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

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

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

F. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

G. Galvanized Surfaces:

1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

H. Ferrous Metal:

1. Solvent clean according to SSPC-SP 1.
2. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
3. Remove rust, loose mill scale, and other foreign substances using methods recommended in writing by paint manufacturer and blast cleaning in accordance with SSPC-SP 6/NACE No.3. Protect from corrosion until coated.

I. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

J. Glue-Laminated Beams: Prior to finishing, wash surfaces with solvent, remove grease and dirt.

K. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with clear sealer.

3.3 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

E. Sand wood and metal surfaces lightly between coats to achieve required finish.

F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

G. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 CLEANING

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

3.5 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 09 9300
STAINING AND TRANSPARENT FINISHING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Field application of stains.

1.2 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.

1.3 REFERENCE STANDARDS

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

B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2024.

C. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2020.

D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

1.4 SUBMITTALS

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

B. Product Data: Provide complete list of products to be used, with the following information for each:

1. Manufacturer's name, product name and catalog number, and general product category.
2. If proposal of substitutions is allowed under submittal procedures, explanation of substitutions proposed.

C. Samples: Two samples on actual wood substrate to be finished, 2 x 2 inch in size, indicating selected colors and sheens for each system, with specified coats cascaded.

D. Maintenance Data: Submit data including finish schedule showing where each product, color, and finish was used, product technical data sheets, safety data sheets (SDS), care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of stain or transparent finish, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Stain and Transparent Finish Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.6 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by manufacturer of stains and transparent finishes.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Do not apply materials when relative humidity exceeds 85 percent, at temperatures less than 5 degrees F (3 degrees C) above the dew point, or to damp or wet surfaces.

D. Minimum Application Temperature: 50 degrees F (10 degrees C) unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 fc (860 lux) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide finishes from the same manufacturer to the greatest extent possible.

1. In the event that a single manufacturer cannot provide specified products, minor exceptions will be permitted provided approval by Architect/Engineer is obtained using the specified procedures for substitutions.

B. Stains:

1. Sherwin-Williams Company: www.sherwin-williams.com/#sle.

2.2 STAINS AND TRANSPARENT FINISHES - GENERAL

A. Finishes:

1. Provide finishes capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.

2. Provide materials compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

3. Supply each finish material in quantity required to complete entire project's work from a single production run.

4. Do not reduce, thin, or dilute finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content:

1. Provide stains and transparent finishes that comply with the most stringent requirements specified in the following:

a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.

b. Architectural coatings VOC limits of the State in which the Project is located.

2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect/Engineer from the manufacturer's full line.

E. Colors: To be selected from manufacturer's full range of available colors.

1. Selection to be made by Architect/Engineer after award of contract.

2.3 INTERIOR STAIN AND TRANSPARENT FINISH SYSTEMS

A. Finish on Wood - Vertical Surfaces:

2.4 ACCESSORY MATERIALS

A. Accessory Materials: Cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of finished surfaces.

B. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin application of stains and finishes until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:

1. Wood: 15 percent, measured in accordance with ASTM D4442.

3.2 PREPARATION

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

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

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Wood Surfaces to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats. Prime concealed surfaces with gloss varnish reduced 25 percent with thinner.

3.3 APPLICATION

A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

C. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

D. Sand wood surfaces lightly between coats to achieve required finish.

E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

F. Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

G. Reinstall items removed prior to finishing.

3.4 CLEANING

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

3.5 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

SECTION 10 2800
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Commercial toilet accessories.

B. Under-lavatory pipe supply covers.

C. Utility room accessories.

1.2 RELATED REQUIREMENTS

A. Section 22 4000 - Plumbing Fixtures: Under-lavatory pipe and supply covers.

1.3 REFERENCE STANDARDS

A. ASTM C1036 - Standard Specification for Flat Glass; 2021.

B. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

C. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2024.

D. ASTM C1822 - Standard Specification for Insulating Covers on Accessible Lavatory Piping; 2021.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement to receive anchor attachments.

1.5 SUBMITTALS

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

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Commercial Toilet, Shower, and Bath Accessories:

1. American Specialties, Inc: www.americanspecialties.com/#sle.
2. Bobrick Washroom Equipment, Inc: www.bobrick.com.
3. Bradley Corporation: www.bradleycorp.com/#sle.
4. Georgia-Pacific Professional: www.gppro.com/#sle.
5. Substitutions: Section 01 6000 - Product Requirements.

B. Under-Lavatory Pipe Supply Covers:

1. Plumberex Specialty Products, Inc: www.plumberex.com/#sle.
2. Substitutions: Section 01 6000 - Product Requirements.

2.2 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.

B. Keys: Provide 2 keys for each accessory to Owner; master key lockable accessories.

C. Mirror Glass: Tempered safety glass, ASTM C1048; and ASTM C1036 Type I, Class 1, Quality Q2, with silvering as required.

D. Adhesive: Two component epoxy type, waterproof.

E. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

2.3 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

2.4 COMMERCIAL TOILET ACCESSORIES

A. Paper Towel Dispenser: Folded paper type, stainless steel, surface-mounted, with viewing slots on sides as refill indicator and tumbler lock.

1. Capacity: 300 C-fold minimum.

B. Automated Soap Dispenser: Liquid soap dispenser, wall-mounted, with stainless steel cover and window to gauge soap level, tumbler lock.

C. Mirrors: Stainless steel framed, 1/4 inch (6 mm) thick tempered safety glass; ASTM C1048.

1. Size: As indicated on drawings.

2. Frame: 0.05 inch (1.3 mm) angle shapes, with mitered and welded and ground corners, and tamperproof hanging system; satin finish.

3. Backing: Full-mirror sized, minimum 0.03 inch (0.8 mm) galvanized steel sheet and nonabsorptive filler material.

2.5 UNDER-LAVATORY PIPE AND SUPPLY COVERS

A. Specified in 22 4000 - Plumbing Fixtures.

2.6 UTILITY ROOM ACCESSORIES

A. Combination Utility Shelf/Mop and Broom Holder: 0.05 inch (1.3 mm) thick stainless steel, Type 304, with 1/2 inch (12 mm) returned edges, 0.06 inch (1.6 mm) steel wall brackets.

1. Hooks: Two, 0.06 inch (1.6 mm) stainless steel rag hooks at shelf front.

2. Mop/broom holders: Three spring-loaded rubber cam holders at shelf front.

3. Length: Manufacturer's standard length for number of holders/hooks.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

3.2 PREPARATION

A. Provide templates and rough-in measurements as required.

3.3 INSTALLATION

A. Install plumb and level, securely and rigidly anchored to substrate.

B. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.

3.4 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION

SECTION 10 4400
FIRE PROTECTION SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fire extinguishers.

B. Fire extinguisher cabinets.

C. Accessories.

1.2 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.

1.3 REFERENCE STANDARDS

A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2023a.

B. FM (AG) - FM Approval Guide; Current Edition.

C. NFPA 10 - Standard for Portable Fire Extinguishers; 2022.

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

1.4 SUBMITTALS

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

B. Product Data: Provide extinguisher operational features.

C. Shop Drawings: Indicate locations of cabinets and cabinet physical dimensions.

1.5 FIELD CONDITIONS

A. Do not install extinguishers when ambient temperature may cause freezing of extinguisher ingredients.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Fire Extinguishers:

1. Activar Construction Products Group, Inc. - JL Industries: www.activarcpg.com/#sle.
2. Kidde, a unit of United Technologies Corp: www.kidde.com/#sle.
3. Larsen's Manufacturing Co: www.larsensmfg.com/#sle.
4. Potter-Roemer: www.potterroemer.com/#sle.

B. Fire Extinguisher Cabinets and Accessories:

1. Activar Construction Products Group, Inc. - JL Industries; Ambassador Series: www.activarcpg.com/#sle.
2. Kidde, a unit of United Technologies Corp: www.kidde.com/#sle.
3. Larsen's Manufacturing Co: www.larsensmfg.com/#sle.

4. Potter-Roemer: www.potterroemer.com/#sle.

2.2 FIRE EXTINGUISHERS

A. Fire Extinguishers - General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
   1. Provide extinguishers labeled by UL (DIR) or FM (AG) for purpose specified and as indicated.

B. Multipurpose Dry Chemical Type Fire Extinguishers: Carbon steel tank, with pressure gauge.
   1. Class: A:B:C type.
   2. Finish: Baked polyester powder coat, red color.

C. Dry Chemical Type Fire Extinguishers: Stainless steel tank, with pressure gauge.
   1. Class: K type.
   2. Size: 1.6 gallons (6 L).
   3. Finish: Polished stainless steel.
   4. Temperature range: Minus 20 degrees F (Minus 29 degrees C) to 120 degrees F (49 degrees C).

2.3 FIRE EXTINGUISHER CABINETS

A. Fire Rating: Listed and labeled in accordance with ASTM E814 requirements for fire resistance rating of walls where being installed.

B. Cabinet Construction: Non-fire rated.
   1. Formed primed steel sheet; 0.036 inch (0.9 mm) thick base metal.

C. Cabinet Configuration: Recessed type.
   1. Size to accommodate accessories.
   2. Trim: Flat square edge, with wide face.
   3. Provide cabinet enclosure with right angle inside corners and seams, and with formed perimeter trim.

D. Door: 0.036 inch (0.9 mm) metal thickness, reinforced for flatness and rigidity with roller type catch. Hinge doors for 180 degree opening with continuous piano hinge.

E. Door Glazing: Tempered glass, clear, 1/8 inch (3 mm) thick, and set in resilient channel glazing gasket.

F. Cabinet Mounting Hardware: Appropriate to cabinet, with pre-drilled holes for placement of anchors.

G. Fabrication: Weld, fill, and grind components smooth.

H. Finish of Cabinet Exterior Trim and Door: No.4 - Brushed stainless steel.

I. Finish of Cabinet Interior: Stainless steel.

2.4 ACCESSORIES

A. Extinguisher Brackets: Formed steel, chrome-plated.

B. Lettering: “FIRE EXTINGUISHER” decal, or vinyl self-adhering, prespaced black lettering in accordance with authorities having jurisdiction (AHJ).

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify rough openings for cabinet are correctly sized and located.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Secure rigidly in place.

C. Place extinguishers in cabinets.

3.3 SCHEDULES

A. Typical Type: Multipurpose Dry Chemical Type ABC within cabinet.

B. Catering Prep: Dry Chemical Type K within cabinet.

C. Maintenance areas: Multipurpose Dry Chemical Type ABC mounted on brackets.

END OF SECTION

SECTION 11 4000
FOODSERVICE EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Food service equipment.

B. Connections to utilities.

1.2 RELATED REQUIREMENTS

A. Section 11 4001 - Custom Fabricated Foodservice Equipment.

1.3 REFERENCE STANDARDS

A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. NSF 2 - Food Equipment; 2022.

1.4 SUBMITTALS

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

B. Product Data: Provide data on appliances; indicate configuration, sizes, materials, finishes, locations, and utility service connection locations, service characteristics, and wiring diagrams.

C. Operation Data: Provide operating data for the specified equipment .

D. Maintenance Data: Provide lubrication and periodic maintenance requirement schedules .

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

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacture of standard products of the type specified.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products clear of floor in a manner to prevent damage.

B. Coordinate size of access and route to place of installation.

1.7 WARRANTY

A. Provide five year manufacturer warranty for replacement or repair of scheduled equipment, refrigerant and compressors, including disconnection and removal of defective unit, and connection of replacement unit.

PART 2 PRODUCTS

2.1 EQUIPMENT

A. Equipment Schedule: Refer to schedule at end of this section.

1. Custom Fabricated Stainless Steel Equipment: See Section 11 4001.

B. Installation Accessories: Provide all rough-in hardware, supports and connections, attachment devices, closure trim, and accessories required for complete installation.

2.2 MATERIALS

A. Stainless Steel Sheet: ASTM A666 Type 304 commercial grade, No. 4 finish.

2.3 FABRICATION

A. Accommodate site installation of other services or equipment.

2.4 FINISHES

A. Stainless Steel: No. 4 finish.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify ventilation outlets, service connections, and supports are correct and in required location.

B. Verify that electric power is available and of the correct characteristics.

3.2 INSTALLATION

A. Install items in accordance with manufacturers' instructions.

B. Insulate to prevent electrolysis between dissimilar metals.

C. Weld and grind joints in steel work tight, without open seams, where necessary due to limitations of sheet sizes or installation requirements.

D. Sequence installation and erection to ensure correct mechanical and electrical utility connections are achieved.

E. Use anchoring devices appropriate for equipment and expected usage.

F. Provide sealant to achieve clean joint with adjacent building finishes and between abutting components.

3.3 ADJUSTING

A. Adjust equipment and apparatus to ensure proper working order and conditions.

B. Remove and replace equipment creating excessive noise or vibration.

3.4 CLEANING

A. Remove masking or protective covering from stainless steel and other finished surfaces.

B. Wash and clean equipment.

C. Polish glass, plastic, hardware, accessories, fixtures, and fittings.

3.5 CLOSEOUT ACTIVITIES

A. At completion of work, provide qualified and trained personnel to demonstrate operation of each item of equipment and instruct Owner in operating procedures and maintenance.

1. Test equipment prior to demonstration.

3.6 PROTECTION

A. Remove protective coverings from prefinished work.

B. Protect finished work from damage.

3.7 FOOD SERVICE EQUIPMENT SCHEDULE

A. ITEM #1 WIRE SHELVING

1. Quantity: One (1).
2. Basis of Design: Olympic.
3. Alternates: Advance Tabco.
4. Model: LOT.
5. Components:
   a. Five (5) each J1848K Shelf, wire, 18" x 48", green epoxy finish with chromate substrate, NSF.
   b. Four (4) each J74 Post 74", stationary, grooved at 1" intervals, includes leveling bolt and cap, green epoxy finish with chromate substrate, NSF.

B. ITEM #2 WIRE SHELVING

1. Quantity: One (1).
2. Basis of Design: Olympic.
3. Alternates: Advance Tabco.
4. Model: LOT.
5. Components:
   a. Five (5) each J1836K Shelf, wire, 18" x 36", green epoxy finish with chromate substrate, NSF.
   b. Four (4) each J74 Post 74", stationary, grooved at 1" intervals, includes leveling bolt and cap, green epoxy finish with chromate substrate, NSF.

C. ITEM #3 REACH-IN REFRIGERATOR

1. Quantity: One (1).
2. Basis of Design: True Mfg. - General Foodservice.
3. Alternates: Beverage Air.
4. Model: T-49-HC.
5. Components:
   a. Refrigerator, reach-in, two-section, (2) stainless steel doors, (6) PVC coated adjustable wire shelves, interior lighting, stainless steel front, aluminum sides, aluminum interior with stainless steel floor, 4" casters, R290 Hydrocarbon refrigerant, 1/2 HP, 115v/1-ph, 5.4 amps, NEMA 5-15P, cULus, UL EPH Classified, Made in USA, ENERGY STAR®.

b. Self-contained refrigeration standard.

c. 7 year compressor warranty, 6 years parts warranty, 5 year labor warranty standard.

d. Left door hinged left, right door hinged right standard.

e. 4" stem castors, standard (adds 5" to OA height).

D. ITEM #4 REACH-IN REFRIGERATOR

1. Quantity: One (1).
2. Basis of Design: True Mfg. - General Foodservice.
3. Alternates: Beverage Air.
4. Model: T-23-HC.
5. Components:

a. Refrigerator, reach-in, one-section, (1) stainless steel door, (3) PVC coated adjustable wire shelves, interior lighting, stainless steel front, aluminum sides, aluminum interior with stainless steel floor, 4" casters, R290 Hydrocarbon refrigerant, 1/4 HP, 115v/1-ph, 2.2 amps, NEMA 5-15P, cULus, UL EPH Classified, Made in USA, ENERGY STAR®.

b. Self-contained refrigeration standard.

c. 7 year compressor warranty, 6 years parts warranty, 5 year labor warranty standard.

d. Door hinged right.

e. 4" stem castors, standard (adds 5" to OA height).

E. ITEM #5 REACH IN FREEZER

1. Quantity: One (1).
2. Basis of Design: True Mfg. - General Foodservice.
3. Alternates: Beverage Air.
4. Model: T-35F-HC.
5. Components:

a. Freezer, Reach-in, two-section, -10°F, (2) stainless steel doors, (6) PVC coated adjustable wire shelves, interior lighting, stainless steel front, aluminum sides, aluminum interior with stainless steel floor, 4" castors, R290 Hydrocarbon refrigerant, 1 HP, 115v/60/1-ph, 9.6 amps, NEMA 5-15P, Made in USA, cULus, UL EPH Classified, ENERGY STAR®

b. Self-contained refrigeration standard

c. 7 year compressor warranty, 6 years parts warranty, 5 year labor warranty standard

d. Left door hinged left, right door hinged right standard

e. 4" stem castors, standard (adds 5" to OA height)

F. ITEM #6 WORK TABLE, STAINLESS STEEL TOP

1. Quantity: Three (3).
2. Basis of Design: Eagle Group.

3. Alternates: Advance Tabco.
4. Model: T2448SEB.
5. Components:
    a. Deluxe Series Work Table, 48" x 24", 16/300 series stainless steel top, rolled edge front and back, adjustable 430 stainless steel undershelf with marine edge, Uni-Lok® gusset system, (4) stainless steel legs and adjustable bullet feet, NSF
    b. CA4-SB Table Casters, set of (4), 4" diameter, (2) swivel and (2) swivel/brake, 115 lbs capacity per caster, zinc with resilient tread, NSF

G. ITEM #7 ELECTRICAL REEL
1. Quantity: One (1).
2. Basis of Design: APC Group, Inc.
3. Alternates: Approved Equal.
4. Model: KL-201514-D.
5. Components:
    a. 20ft, 15 amp, 14 gauge kitchen leash retractable dual duplex reel. Ceiling mount bracket included.

H. ITEM #8 WORK TABLE, STAINLESS STEEL TOP
1. Quantity: Two (2).
2. Basis of Design: Eagle Group.
3. Alternates: Advance Tabco.
4. Model: T3072SEB.
5. Components:
    a. Deluxe Series Work Table, 72" x 30", 16/300 series stainless steel top, rolled edge front and back, adjustable 430 stainless steel undershelf with marine edge, Uni-Lok® gusset system, (4) stainless steel legs and adjustable bullet feet, NSF.
    b. CA4-SB Table Casters, set of (4), 4" diameter, (2) swivel and (2) swivel/brake, 115 lbs capacity per caster, zinc with resilient tread, NSF.

I. ITEM #9 HAND SINK
1. Quantity: One (1).
2. Basis of Design: Eagle Group.
3. Alternates: Advance Tabco.
4. Model: HSA-10-LRS.
5. Components:
    a. Hand sink, wall mount, 13-1/2" wide x 9-3/4" front-to-back x 6-3/4" deep bowl, 304 stainless steel construction, requires splash mounted faucet, deep-drawn seamless design positive drain, inverted "V" edge, left and right side splashes, NSF.
    b. T&S Brass EC-3105 ChekPoint™ Electronic Faucet, wall mount, 4" centers, rigid gooseneck spout, 2.2 GPM vandal resistant aerator, AC/DC control module with internal flow control, temperature control mixing valve with integral check valves, chrome plated brass, flexible stainless steel supply hoses, ADA compliant.

J. ITEM #10 UNDERCOUNTER DISHWASHER

1. Quantity: One (1).
2. Basis of Design: Hobart.
3. Alternates: Approved Equal.
4. Model: Centerline by Hobart CUH-1.
5. Components:
    a. High temperature undercounter dishwashing machine, 22 11/16"W x 24"D x 32 5/16"T, 1/3 hp / 3/5 hp, 208-240V-1ph, 24.2-27.5 amps, hardwired, 24 racks per hour, hot water sanitizing, 2-minute cycle with optional extended cycle, snap-in, revolving upper and lower anti-clogging wash and rinse arm (low-profile, single arm design), integrated booster heater capable of 70°F rise, removable stainless steel scrap screen, automatic pumped drain, automatic fill, delime notification and cycle, electric tank heat, ENERGY STAR®, CULUS, NSF.
    b. Two standard dishracks 20" x 20" - one peg and one combination type.

K. ITEM #11 WORK TABLE, STAINLESS STEEL TOP

1. Quantity: One (1).
2. Basis of Design: Eagle Group.
3. Alternates: Advance Tabco.
4. Model: T2472SEB.
5. Components:
    a. Deluxe Series Work Table, 72" x 24", 16/300 series stainless steel top, rolled edge front and back, adjustable 430 stainless steel undershelf with marine edge, Uni-Lok® gusset system, (4) stainless steel legs and adjustable bullet feet, NSF
    b. CA4-SB Table Casters, set of (4), 4" diameter, (2) swivel and (2) swivel/brake, 115 lbs capacity per caster, zinc with resilient tread, NSF

L. ITEM #12 WORK TABLE, STAINLESS STEEL TOP

1. Quantity: One (1).
2. Basis of Design: Eagle Group.
3. Alternates: Advance Tabco.
4. Model: SPECFAB.
5. Components:
    a. Deluxe Series Work Table, 80"W x 30"D, 16/300 series stainless steel top,6"H backsplash with rear turndown and Z-clips, (2) 8" O.C. splash mount faucet hole provisions, left and right end splash, rolled front edge, Uni-Lok® gusset system, (2) 18" x 20" x 14"D sink bowl, stainless steel twist brackets, stainless steel crossrails on side and rear, stainless steel legs and adjustable bullet feet, NSF.
    b. Two (2) each T&S Brass Model B-0133-ADF08 EasyInstall Pre-Rinse Unit, Wall mount base, 8" centers, 44" flexible hose with overhead spring body and B-0107 spray valve, 18" riser, add-on faucet with 8" swing nozzle, lever handles, 1/2" NPT female inlets, quarter-turn Eterna cartridges, low lead.

c. Two (2) each T&S Brass Model B-0109-01 Wall Bracket 6".

d. Two (2) each T&S Brass B-3950-01 Waste Valve, twist handle, 3-1/2" sink opening, 2" drain outlet with 1 1/2" adapter and overflow assembly.

END OF SECTION

SECTION 11 4001
CUSTOM FABRICATED FOODSERVICE EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Custom fabricated stainless steel units, including:

1. Food preparation tables, sinks, and shelving.
2. Dish and tray washing tables, sinks, and shelving.

1.2 RELATED REQUIREMENTS

A. Section 11 4000 - Foodservice Equipment: General requirements covering all food service equipment work; manufactured equipment items.

1.3 REFERENCE STANDARDS

A. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.

B. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.

C. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes; 2018.

D. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications; 2023a.

E. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2022.

F. ASTM A270/A270M - Standard Specification for Seamless and Welded Austenitic and Ferritic/Austenitic Stainless Steel Sanitary Tubing; 2023.

G. ASTM A276/A276M - Standard Specification for Stainless Steel Bars and Shapes; 2024.

H. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2023.

I. ASTM B32 - Standard Specification for Solder Metal; 2020.

J. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.

K. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2019.

L. NSF 2 - Food Equipment; 2022.

M. SMACNA (KVS) - Kitchen Ventilation Systems and Food Service Equipment Fabrication and Installation Guidelines; 2001.

N. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; 2008.

1.4 SUBMITTALS

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

B. Product Data: Submit manufacturer's data sheets on each manufactured product to be used, including:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.

3. Installation methods.
4. Configuration, sizes, materials, finishes, locations, utility connections and locations.

C. Shop Drawings: Submit floor plans, elevations, cross-sections, and construction details for fabricated units specified, including:

1. Layout and anchorage of equipment and accessories, including clearances for maintenance and operation and required electrical or plumbing connections.
2. Size, type, and location of equipment drain lines and floor drains.
3. Special conditions, including required slab depressions, cores, wall openings, blockouts, ceiling pockets, access panels, and above ceiling hanger assemblies.
4. Wiring, piping, and schematic diagrams.

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

1.5 QUALITY ASSURANCE

A. Manufacturer/Fabricator Qualifications: Company specializing in manufacture of commercial food services equipment with minimum three years documented experience and NSF certified for type of equipment specified.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver fixed equipment that is not to be integrated into structure until after completion of finished ceilings, floor and walls, painting, and lighting.

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

C. Tape fiberboard or plywood to surfaces as required by equipment shape and installation access requirements.

D. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.7 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results, and do not install products under environmental conditions outside manufacturer's absolute limits.

1.8 WARRANTY

A. Correct defective Work within a one year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.1 MATERIALS

A. Stainless Steel: 18-8 percent chromium-nickel composition, minimum; alloy Type 302, 304, or 316; No. 4 - Brushed finish on exposed surfaces.

1. Sheets: ASTM A240/A240M or ASTM A666.
2. Tubing: ASTM A269/A269M or ASTM A270/A270M; of true roundness with seams and welds ground smooth.
3. Bars: ASTM A276/A276M.

B. Copper Tubing: ASTM B88; Type L, hard drawn.

1. Fittings: ASME B16.18, ASME B16.22, or ASME B16.26.
2. Solder: ASTM B32, lead-free.
3. Brazing Alloy: AWS A5.8M/A5.8 silver solder.

C. Sound Deadening Material: Bituminous paint or other water resistant mastic.

D. Manufactured Components:

1. Finish Hardware: Manufacturer's standard; stainless steel with polished finish.
2. Feet for Legs: Bullet shaped stainless steel; screwed into tubular legs with concealed screw threads; minimum 1 inch (25 mm) vertical adjustment.

E. Bolts, Screws, and Rivets: Stainless steel; do not use on exposed surfaces unless specifically indicated or unavoidable.

1. Bolt and Screw Caps: Provide lock washer and chromium-plated brass/bronze acorn nut to cap visible or exposed threads on inside of fixtures.

F. Anchoring Devices: Stainless steel, of type appropriate for use; provide seismic anchorage as specified in SMACNA (KVS).

2.2 CUSTOM FABRICATED UNITS - GENERAL REQUIREMENTS

A. See drawings for dimensions and configurations; ensure proper fit by taking field measurements prior to fabrication.

B. Provide fully shop assembled units complying with SMACNA (KVS) and NSF 2 and stainless steel components, unless otherwise indicated.

1. Where details are referenced as "SMACNA" details, refer to SMACNA (KVS).
2. Stainless Steel Sheet: For surfaces up to 12 feet (3.7 m) in length provide one continuous sheet without joints or welds, including back and end splashes.
3. Joints: Provide welded joints unless specifically indicated or not possible; do not solder or braze stainless steel; do not use bolts, screws, or other fasteners on work surfaces, food contact surfaces, or wet surfaces.
4. Drainage of Surfaces: Provide distinct pitch of top surfaces toward waste or drain outlets while maintaining level tops of rolled and marine edges and back and end splashes.
5. Drainage of Equipment: Provide drain piping as indicated; where compartments or pans are intended to hold liquids or catch drips and no drain piping is indicated, provide drain fitting and gravity draining piping terminating over nearest floor drain.
6. Shop prepare openings for plumbing fixtures, fittings, and other service components.
7. Sound Deadening: Apply sound deadening material to accessible internal surfaces of metal work and underside of metal counters and sinks.

C. Sinks: Stainless steel, 14 gage, 0.0747 inch (1.9 mm) thickness, minimum; provide integral sinks continuously welded to work surfaces, unless otherwise indicated.

1. Slope to drain at 1 percent, unless otherwise indicated.
2. Fittings: Provide waste and overflow fittings, faucets, baskets, and other plumbing fittings as specified in Section 22 4000.
3. Sink Faucet Spout Outlets: 5 inches (127 mm), minimum, above rim of sink.

D. Counter and Table Tops: Stainless steel, 14 gage, 0.0747 inch (1.9 mm) thick, minimum; with underbracing as recommended by SMACNA (KVS), and bullnose edges and 45-degree back and end splashes, unless otherwise indicated.

E. Counter, Table, and Sink Edges: Provide finished edge on all open sides; close open ends down to bottom edge of turn down; if not otherwise indicated provide bullnose edges.

1. Bullnose Edges: SMACNA Figure 2-3 Detail A; 2 inch (51 mm) turn down at 5/8 inch (16 mm) radius, returned at 60 degree angle to not closer than 3/4 inch (19 mm) to face of cabinet or case.

2. Marine Edges: 1/2 inch (13 mm) 45 degree angle turn up, 1-1/2 inch (38 mm) flat surface, 2 inches (51 mm) turn down; with 1/2 inch (13 mm).

F. Back and End Splashes: Provide wherever tops abut walls or other vertical surfaces; close open ends from top to bottom of turned down top edge.

1. 45 Degree Back and End Splashes: 6 inches (152 mm) high, coved at 5/8 inch (16 mm) radius, turned back 2 inches (51 mm) at the top at 45 degree angle, turned down 1 inch (25 mm).

2. Where indicated and where required for concealment of plumbing, make horizontal dimension of back and end splashes at least 2-1/2 inches (64 mm) from face of wall.

G. Legs: Stainless steel tubing, 1-5/8 inches (41 mm) outside diameter; fit legs with set-screw fastened sockets and adjustable feet as specified.

1. Weld leg sockets to continuous channel or angle or gusset plates; provide stainless steel triangular pad where leg gussets are welded to frame.

2. Legs may be bolted to table tops using studs welded to bottom of top.

3. Where vibration or oscillation is anticipated anchor in floor with 1/4 inch (6 mm) stainless steel pins.

4. Unless otherwise indicated provide legs for all units.

H. Shelves: Stainless steel.

1. Undercounter Shelves: 16 gage, 0.0598 inch (1.5 mm) thick.

I. Casework Not Otherwise Specified: Stainless steel, 20 gage, 0.0359 inch (0.90 mm) thick.

2.3 FOOD PREPARATION

A. Vegetable Preparation Counter: Integral sinks and drainboards.

1. Sink Compartments: Two.

2. Drainboards: One side.

3. Undershelves: Full length and depth of table; provide at each table.

2.4 FABRICATION

A. Joints, Bends, and Edges: Make each joint close fitting, especially butt and contact joints.

1. Make brake bends free of open-texture or orange peel appearance.

2. Make sheared edges free of burrs, projections, and fins.

3. Neatly finish mitered and bullnosed corners with under edge of material ground to uniform condition, without overlapping materials or cracks.

B. Welding: Make each welded joint smooth, ductile, and watertight, without gaps, holes, or discoloration or marring of surface adjacent to welds.

1. Use welding processes and filler metal compatible with material being welded. Do not use carbon arc welding on surfaces that will be exposed to view in finished work.
2. Grind exposed welds flush with adjacent material; finish and polish to match adjacent surface.
    a. Avoid excessive heating of metal and metal discoloration.
    b. When grinding, use iron-free abrasives, wheels, and belts that have not been used on carbon-steel.
    c. Remove pits, runs, sputter, cracks, low spots, voids, buckles, and other imperfections.
    d. Remove grain of rough grinding by several successively finer polishings until specified finish is attained.
3. When welding sheet, penetrate entire thickness for entire length of joint; make joints flat, continuous and homogeneous with sheet metal without reliance on straps under seams, filling with solder, or spot welding.
4. When stainless steel is joined to dissimilar materials, use stainless steel for fastening devices and welding material.
5. Protection Against Corrosion: Eliminate possibility of corrosion wherever welding occurs on stainless steel, and minimize possibility of carbide precipitation in welding bolts and screws.
6. When welding galvanized steel, thoroughly clean and repair damaged galvanizing and coat welds with polyurethane coating.
7. Where bolts or screws are welded to underside of tops or trim, finish and undepress the exposed side of welds.
8. Coat welds and discolorations that are not exposed to view in finished work with metallic-based paint to prevent the possibility of progressive corrosion of joints, unless welds are ground and polished smooth.

C. Brazing of Copper Tubing to Brass and Bronze Fittings: Use silver solder, and do not braze stainless steel.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. Verify correct locations of utility connections, floor drains, ventilation connections, and supports.

C. If substrate preparation is the responsibility of another installer, notify Architect/Engineer of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

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

3.3 INSTALLATION

A. Install in accordance with fabricator's instructions and recommendations, plumb and level and in proper locations, ready for utility connections.

B. Lay out work in advance to prevent damage to building, piping, wiring, or equipment; cut, fit, and patch where necessary; coordinate work with others.

C. Do not cut or fit units in the field; if adjustments are necessary due to inadequate field measurement prior to fabrication, take unit back to shop and perform modifications there.

D. Do not field weld unless absolutely necessary; weld and grind field joints in accordance with specified fabrication procedures.

E. Securely anchor and attach non-mobile or adjustable-leg equipment to walls, floors, or bases with stainless steel bolts.

F. Follow SMACNA (SRM) seismic restraint recommendations for project location.

3.4 ADJUSTING

A. Adjust new and existing equipment to ensure proper operation.

3.5 CLEANING

A. Remove masking or protective covering from stainless steel and other finished surfaces.

B. Clean equipment to condition suitable for food preparation use.

3.6 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 21 1313
FIRE SUPPRESSION SPRINKLER SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pipes

B. Pipe Fittings

C. Joining Materials

D. Sprinklers

1.2 REFERENCES

A. Sprinkler system design, equipment, materials, devices, and installation shall conform to NFPA Codes and Requirements of Governmental Bodies and Bureaus as listed below:

1. NFPA 13, 13R, 14, 24, 75 and other standards as applicable.
2. Local Fire Department
3. State Fire Marshal
4. City Building Department
5. International Building Code
6. Factory Mutual (FM)
7. Underwriters Laboratory (UL)

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instructions for all fire protection materials and products.

B. Shop Drawings: Submit scaled, dimensioned installation drawings and supporting hydraulic calculations. Provide drawings and calculations that have been approved by the Authority Having Jurisdiction and that are prepared and stamped by a Registered Engineer or technician with NICET level III certification.

C. Contractor's Material & Test Certificate: Submit completed Contractor's Material & Test Certificate for each system.

D. At project closeout, submit record drawings of installed fire protection piping and products.

E. Submit operating and maintenance data and parts lists for fire protection materials and products. Include this data, product data, shop drawings, approved drawings, approved calculations, certificate of installation, and record drawings in maintenance manual.

1.4 QUALITY ASSURANCE

A. All installation work shall be performed by licensed fire protection sprinkler contractors, licensed for such work where the work is to be performed.

1.5 WIRING

A. The Division 26 Contractor shall furnish wiring for signal and alarm devices furnished by sprinkler contractor.

1.6 SPRINKLER DESIGN

A. The Contractor shall coordinate with the City of Solon and shall perform a hydrant flow test in the vicinity of this project prior to completion of the shop drawings. The sprinkler system design shall be hydraulically calculated based on the current flow test results. The results and date of the current flow test shall be clearly indicated on the first sheet of the shop drawings submitted.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Sprinklers

a. Reliable Automatic Sprinkler Co., Inc.

b. Tyco Fire Products, LP.

c. Victaulic Company of America

d. Viking Corp.

2.2 PIPES

A. Refer to Part 3 Article "Sprinkler System Piping Applications" for identification of systems where pipe and fitting materials specified below are used.

B. Steel Pipe: ASTM A53, Schedule 40, black, plain and threaded ends, for threaded, cut-groove, and rolled-groove joints.

C. Steel Pipe: ASTM A 135, Schedule 10, black, with plain ends for rolled-groove joints.

2.3 PIPE FITTINGS

A. Grooved-End Fittings for Ductile-Iron Pipe: ASTM A 536 ductile-iron or ASTM A 47 malleable-iron, AWWA pipe-size, designed to accept AWWA C606 grooved couplings. Include cement lining or Food and Drug Administration (FDA)-approved interior coating.

B. Steel Fittings: ASTM A234, seamless or welded; ASME B16.3, Class 150, zinc coated, threaded; ASME B16.9, buttwelding; or ASME B16.11, socket-welding type for welded joints.

C. Steel Flanges and Flanged Fittings: ASME B16.5.

D. Grooved-End Fittings for Steel Pipe: UL-listed and FM-approved, ASTM A 536, Grade 65-45-12 ductile iron or ASTM A 47 Grade 32510 malleable iron, with grooves or shoulders designed to accept grooved couplings.

2.4 JOINING MATERIALS

A. Joints

1. Threaded Pipe - make joints using approved pipe joint compound, applied to male threads only. Cut pipe square, cut threads clean, remove burrs, and ream ends to full size bore. Threads shall not be exposed on chromium plated pipe.

2. Welded Pipe - welding shall conform to welding section of ANSI B31.1 "Code for Power Piping." Pipe up to 2" diameter shall be screwed. Pipe 2-1/2" diameter and over shall be welded.

2.5 SPRINKLERS

A. Automatic Sprinklers with quick-response element conforming to:

1. UL 199 and FM-approved, for applications except residential.

B. Sprinkler types and categories are as indicated and as required by application. Furnish automatic sprinklers with nominal ½-inch orifice and ½-inch NPT.

C. Sprinkler heads shall be of the following types:

1. Areas with suspended ceiling; quick response; concealed pendant type with white factory finish or cover plate. Reliable model G5 or approved equivalent.

2. For sprinklers serving dry systems:

a. Dry pendant, quick response, concealed type chrome-plated, two piece escutcheon ring, Reliable model F3QR series or approved equivalent.

b. Areas without finished ceilings, in concealed saces and under ducts; quick response, upright-type head for exposed piping, brass finish, Reliable F1FR series or approved equivalent.

3. Sidewall; quick response, recessed type chrome-plated, two piece escutcheon ring, Reliable model F1FR series or approved equivalent.

4. Areas without finished ceilings, in concealed spaces and under ducts; quick response, upright-type head for exposed piping, brass finish, Reliable F1FR series or approved equivalent.

5. Dry pendant for freezers or other areas subject to freezing, quick response, recessed type chrome-plated, two piece escutcheon ring, Reliable model F3QR series or approved equivalent.

6. Dry sidewall for exterior overhangs, quick response, standard escutcheon, sprinkler and escutcheon finish by architect to coordinate with with exterior finish. Dry barrel length shall be coordinated with wall thickness and manufacturer's recommended barrel length on warm side of insulation based on anticipated low ambient temperature condition. Reliable F3QR56 series or approved equivalent.

D. Sprinkler heads shall be of the ordinary temperature range 160° F except where subject to high temperatures caused by unit heaters, hot pipes, radiant ceilings, or other heat source, heads shall be of high temperature type, 250° F.

E. Sprinkler Guards: Wire-cage type, including fastening device for attaching to sprinkler.

F. Sprinkler Cabinets: Finished steel cabinet and hinged cover, with space for minimum of 6 spare sprinklers plus sprinkler wrench, suitable for wall mounting. Include number of sprinklers required by NFPA 13 and 1 wrench for sprinklers. Include separate cabinet with sprinklers and wrench for each style sprinkler on project.

2.6 SPECIALTY SPRINKLER FITTINGS

A. Mechanical "T" Fittings: UL 213, ductile-iron housing with pressure-responsive gasket, bolts, and threaded or locking-lug outlet.

B. Mechanical Cross Fittings: UL 213, ductile-iron housing with pressure-responsive gaskets, bolts, and threaded or locking-lug outlets.

C. Drop-Nipple Fittings: UL 1474, with threaded inlet, threaded outlet, and seals; adjustable.

D. Sprinkler Alarm Test Fittings: Ductile-iron housing with 1½-inch (DN 40) inlet and outlet, integral test valves, combination orifice and sight glass, and threaded or locking lug ends.

PART 3 EXECUTION

3.1 SPRINKLER SYSTEM PIPING APPLICATIONS

A. Refer to Part 2 of this Section for detailed specifications on pipe and fittings products listed below. Use pipe, fittings, and joining methods according to the following applications. Piping may be joined with flanges instead of indicated joints. Use grooved-end fittings with grooved couplings that are made by the same manufacturer and that comply with listing when used together for grooved-coupling joints.

1. Option: Mechanical "T" bolted-branch-outlet fittings, instead of fitting types specified may be used for branch connections.

B. Drains and Pipe between Fire Department Connections and Check Valves: Use galvanized steel pipe instead of black steel pipe when steel pipe is specified for applications below. Do not use welded joints.

C. Sizes 10" and Smaller for Wet Pipe Systems: ASTM A 53 or A 135 Schedule 40 steel pipe with rolled-groove or cut-groove ends, grooved-end steel pipe fittings, and grooved-coupling joints. Threaded acceptable 2" and under.

D. Sizes 2½" to 6" for Wet Pipe Systems: ASTM A 135 or A 795, Schedule 10 steel pipe with rolled groove ends, grooved-end steel pipe fittings, and grooved-coupling joints.

3.2 JOINT CONSTRUCTION

A. Grooved-End Pipe and Grooved-End Fitting Joints: Use groove-end fittings and grooved couplings that are made by the same manufacturer and that are listed for use together. Groove pipe and assemble joints with grooved coupling, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

B. Mechanically Formed Outlet Joints: Use UL-listed procedure and follow forming equipment manufacturer's written instructions. Drill pilot hole in tube, form branch for collar, dimple tube to form seating stop, and braze branch tube into formed-collar outlet.

C. Locking-Lug Joints: Follow manufacturer's written instructions.

3.3 PIPING INSTALLATIONS

A. Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate general location and arrangement of piping. Install piping as indicated, as far as practical.

1. Deviations from approved shop drawings for sprinkler piping require written approval from authority having jurisdiction. File written approval with the Architect prior to deviating from approved shop drawings.

B. Use approved fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

C. Install flanges or flange adapters on valves, apparatus, and equipment having 2½-inch and larger connections.

D. Install combination Inspector's Test Connection and Drain in sprinkler piping, sized on the system riser, if acceptable to the authority having jurisdiction.

E. Install sprinkler piping with drains for complete system drainage.

F. Install ball drip valves to drain piping between fire department connections and check valves, and where indicated. Drain outside building.

G. Install alarm devices in piping systems.

H. Hangers and Supports: Comply with NFPA 13.

1. Install hanger and support spacing and locations for steel piping joined with grooved mechanical couplings according to manufacturer's written instructions for rigid systems.

2. Do not hang from joist bridging. Joist bridging is not considered structural.

I. Install pressure gauges on riser. Include pressure gauges with connection not less than ¼" and with soft metal seated globe valve, arranged for draining pipe between gauge and valve. Install gauges to permit removal, and install where they will not be subject to freezing.

J. Hold riser piping and components as close to wall as allowable. Install riser components vertically, when possible, rather than horizontally to minimize space requirements. Risers to second floor shall not pass through sales areas or electrical rooms.

3.4 HYDRAULIC CALCULATIONS

A. Size system piping such that total required system pressure at demand flow (including hose streams) is at least 5 psi less than the available pressure at demand flow. Include in calculations, the greater of the following:

1. 8-psi allowance for future reduced pressure principle backflow preventer installed at service entrance.

2. Actual backflow preventer installed.

3.5 SPRINKLER APPLICATIONS

A. Rooms without Ceilings: Upright sprinklers.

B. Rooms with Ceilings: Concealed sprinklers.

C. Sprinkler Temperature Ratings: Use sprinklers with the following temperature ratings in the applications listed unless noted otherwise on drawings:

1. Ordinary Temperature Classification (165° F): Public areas, classrooms, offices, janitor's closets, mechanical equipment rooms.

2. Intermediate Temperature Classification (212° F): Top of elevator hoistways where ambient temperatures can exceed 100° F, stock rooms.

3.6 SPRINKLER INSTALLATIONS

A. Install sprinklers in locations indicated. When sprinkler locations are not indicated in an area, locate sprinklers to meet this specification.

B. Install sprinklers in suspended ceiling in center of acoustical panels and in center of half of acoustical panels, as shown on plans. The location of sprinklers may deviate up to 3 inches from the center, provided the deviation is continued for all sprinklers in the rows of both directions.

C. Install sprinkler guards on sprinklers in janitor closets and on non-recessed heads within 84 inches of the floor.

3.7 FIELD QUALITY CONTROL

A. Perform field acceptance tests of each fire protection system with Architect/Engineer and authority having jurisdiction present.

1. Flush, test, and inspect sprinkler piping systems according to NFPA 13 Chapter "System Acceptance."

B. Replace piping system components that do not pass test procedures specified then retest to demonstrate compliance. Repeat procedure until satisfactory results are obtained.

1. Complete the Contractor's Material & Test Certificate and submit form promptly to Owner's representative and authority having jurisdiction.

3.8 CLEANING

A. Clean dirt and debris from sprinklers. Replace sprinklers having paint other than factory finish with new sprinklers. Cleaning and reuse of painted sprinklers is prohibited.

END OF SECTION

SECTION 22 0500
COMMON WORK RESULTS FOR PLUMBING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. The work shall include the furnishings of systems, equipment and materials specified in this Division and as called for on the Plumbing Drawings to include supervision, quality control, operation, methods and labor for the fabrication, installation, start-up and tests for the complete plumbing installation. The work shall also include the furnishing of necessary hoisting facilities to set materials and equipment in place and the furnishing of any scaffolding and transportation associated with this work.

B. Examine the project site and become familiar with existing conditions which will affect the work. Review the drawings and specifications of other trades and take note of conditions to be created which will affect the work. All conditions shall be considered in the preparation of bids; no additional compensation will be made on the behalf of this Contractor.

C. Provide labor necessary to demolish the existing plumbing systems as shown on the drawings, as described in Part 3.1, Existing Conditions, or as required.

D. Where noted on the drawings or where called for in other sections of the specification, the Contractor for this division shall install equipment furnished by others, and shall make required service connections. Verify with the supplier of the equipment the requirements for the installation. This contractor shall be responsible for the removal and installation of railings, piping, ductwork, louvers, etc. as required to install new equipment.

1.2 DAMAGE

A. The Contractor shall be responsible for damage to the work of other trades, or to the building and its contents, caused by equipment installation.

1.3 PERMITS AND INSPECTIONS

A. Obtain and furnish necessary permits and inspection certificates for material and labor furnished. Permits and certificates shall be obtained from the proper inspection authorities. The cost of permits, certificates and fees required in connection with the installation shall be borne by the Contractor, unless otherwise noted in the detailed contractual description preceding these specifications. Where applications are required for the procuring of utility services to the building, see that such application is properly filed with the utility, and that information required for such an application is presented to the extent and in the form required by the utility company.

1.4 CODES AND STANDARDS

A. Standards listed by reference, including revisions by issuing authority, form a part of this specification section to the extent indicated. Standards listed are identified by issuing authority, authority abbreviation, designation number, title or other designation established by issuing authority. Standards subsequently referenced herein are referred to by issuing authority abbreviation and standard designation.

B. Applicable provisions of the following codes and standards are hereby imposed on a general basis for the mechanical work in addition to specific applications specified by individual work sections of these specifications.

C. Any product used for dispensing potable water shall meet NSF 61 and NSF 372 testing standards. Third party testing shall be required.

D. If any work indicated on the drawings or specified herein conflicts in any way with any of the rules and regulations of the above Authorities, the Contractor shall promptly notify the Architect/Engineer in writing and do so no less than 72 hours before bids are opened. In the event the Contractor fails to notify the Architect/Engineer and changes are required by said conflicts, the Contractor shall make such changes as are required without additional cost to this Owner.

E. Installations must be safe in every respect, and must not create a condition which will be harmful to building occupants; to operating, installing or testing personnel; to workmen; or to the public. The contractor for each installation shall be solely responsible for providing installations which will meet these conditions. If the Contractor believes that the installation will not be safe for all parties, report these beliefs in writing to the Architect/Engineer before any equipment is purchased or work is installed, giving recommendations. The Architect/Engineer will work out required changes and adjustments in contract price where adjustments are warranted.

1.5 DRAWINGS

A. A complete set of up-to-date Project Drawings and Specifications shall be kept on the site at all times. Prior to installing any of the work, check the drawings for dimensions and see that the work does not interfere with clearance required for ceilings, beams, foundations, finished columns, pilasters, partitions and electrical equipment as shown on the drawings and details. After work is installed and it develops that interferences occur which have not been called to the Architect/Engineer's attention before the installation, the Contractor shall, at his own expense, make such changes in his work as directed by the Architect/Engineer.

B. The contract drawings for plumbing work are in part diagrammatic, intended to convey the scope of work and indicate general arrangement and approximate sizes and locations of equipment and materials. Where job conditions require reasonable changes in indicated locations and arrangement, the Contractor shall make such changes as directed by the Architect/Engineer, without additional cost to the Owner.

C. Because of the scale of the drawings, certain basic items such as pipe fittings, access panels, and sleeves may not be shown; but where such items are required by other sections of these specifications or where they are required by the nature of the work, they shall be furnished and installed. Rough-in dimensions and locations shall be verified with the supplier of equipment furnished by other trades, or by the Owner, prior to the time of roughing-in.

D. Equipment specification may not deal individually with minute items required such as components, parts, controls and devices which may be required to produce the equipment performance specified, or as required to meet the equipment warranties. Where such items are required, they shall be included by the supplier of the equipment, whether or not specifically called for.

E. The drawings and the specifications are cooperative and supplementary. It is the intent of both said drawings and specifications to cover all mechanical requirements in their entirety as nearly as possible. The Contractor shall closely check the drawings and specifications for any obvious errors or omissions and bring any such condition to the attention of the Architect/Engineer prior to the receipt of bids, in order to permit clarification by means of a mailed Addendum. If there is no question prior to the bid proposal date, the Architect/Engineer shall assume that the drawings and specifications are complete and correct and will expect the intent of said documents to be complied with, and the installation to be complete in all respects, according to said intent.

F. Locate equipment which must be serviced, operated or maintained in fully accessible positions. Minor deviations from the contract drawings may be made to allow for better accessibility, but changes of magnitude, or which involve extra cost, shall not be made without prior approval. Ample space shall be allowed for removal of parts that may require replacement or service in the future.

G. All valves, pumps, etc. shall be accessible for maintenance purposes. Locate items carefully and coordinate with other trades so that each valve and piece of equipment is accessible and functional. Items located above a non-accessible ceiling, chase, or soffit shall be accessible through an access door. Coordinate location of access doors with the general contractor.

1.6 RESPONSIBILITY

A. The Contractor's responsibility shall not end with the installation and connecting of the various apparatus. It shall include the services of an experienced superintendent, who shall be constantly in charge of the work, together with the qualified journeymen, helpers and laborers required to properly unload, install, connect, adjust, start, operate and test the work involved, including equipment and materials furnished by other trades or by the Owner, until such time as the entire plumbing installation functions properly in every detail.

1.7 COORDINATION

A. Coordinate the work with other trades prior to installation.

B. No piping or equipment, which is foreign to the electrical equipment, or architectural appurtenances shall be run over the top of any electrical panels or electrical equipment, in accordance with NEC 110.26. This does not prohibit sprinkler protection for the installation.

C. The determination of quantities of material and equipment required shall be made from the drawings. Schedules on the drawings and in the specifications are completed as an aid, but where discrepancies arise, it shall be the Contractor's responsibility to provide the required quantity.

D. Where the specifications state that equipment shall be furnished, installed or provided, it shall be understood to mean this Contractor shall furnish and install completely, unless it is specifically stated that the equipment is to be furnished and installed by others.

E. The Architect/Engineer reserves the right to determine space priority of the contractors in the event of interference between the piping and equipment of the various contractors. Conflicts between the drawings and specifications, or between requirements set forth for the various trades, shall be called to the attention of the Architect/Engineer. If clarification is not asked for prior to the taking of bids, it will be assumed that none is required, and that the Contractor has submitted his bid in conformance with plans and specifications as issued and that no interference exists.

F. No piping or equipment foreign to an elevator hoistway and machine room shall be run inside the hoistway or machine room in accordance with NEC 620.37 and ASME A17.1 Safety Code for Elevators and Escalators.

1.8 GUARANTEE AND MAINTENANCE

A. Materials and equipment shall be guaranteed to be free from defects and to be new equipment; no secondhand, used or salvaged equipment will be allowed. The Owner's existing equipment which is to be relocated or reinstalled under this contract shall be refurbished, cleaned and repaired, and made subject to the guarantee and maintenance as herein specified, unless specifically noted otherwise.

B. Keep the entire portion of the work in repair, without additional cost to the Owner, so far as defects in workmanship, apparatus, material or construction are concerned for one (1) year from the date of final acceptance, except as otherwise specified herein.

C. Equipment which fails to meet performance ratings as specified and shown on the drawings shall be removed and replaced by new equipment that meets the specified requirements, without additional cost to the Owner.

D. Materials and workmanship shall be subject to the review of the Architect/Engineer, in whose presence various tests shall be made as required by these specifications.

PART 3 EXECUTION

2.1 EXISTING CONDITIONS

A. Examine the existing buildings and grounds or site and become familiar with the conditions as they exist, or that will in any manner affect the work under this contract. No allowance will be made subsequently, in this connection, on behalf of the Contractor for any error or negligence by the Contractor.

B. Existing equipment, such as duct or pipe, in or on the existing building and grounds which is to be replaced, or which interferes in any way with the remodeling of the existing facilities and/or installation of new equipment, shall be removed from the premises or relocated by this Contractor, as directed by the Architect/Engineer. Do not remove from the premises any equipment that may have maintenance value to the Owner without permission of the Owner. Equipment, duct or pipe not to be reused shall be removed from the premises, unless otherwise noted herein or shown on the drawings.

C. Where existing equipment is removed or changed, all piping no longer in service shall be removed and stubs plugged as directed by the Architect/Engineer. Building surfaces damaged and openings left by removal of equipment shall be repaired by the proper trades and paid for by this Contractor, unless otherwise noted on the drawings. The cutting and fitting shall be done by this Contractor. The cutting of floor, ceiling or wall surfaces shall be done by this Contractor with extreme care, in order to avoid any disrupting or damage of existing utility services which may be encountered. Coordinate with other trades and with the General Contractor or Construction Manager to minimize the damage to the building in order to reduce the amount of patching required.

D. Where new openings are cut and concealed piping is encountered, such items shall be removed or relocated as required. Where systems to be removed stub through floors, walls or ceilings, openings shall be patched so that no evidence of the former installation remains.

E. Existing active services (water, gas, sewer, electric), when encountered, shall be protected against damage. Do not prevent or disturb operation of active services that are to remain. If active services are encountered which require relocation, make request to authorities with jurisdiction for determination of procedures. Where existing services are to be abandoned, they shall be terminated in conformance with requirements of the utility or municipality having jurisdiction.

F. The location, size and elevation of underground utilities shown on the drawings are in accordance with data supplied by the Owner and/or the various utility companies. The Contractor shall verify this data and shall report any discrepancies to the Architect/Engineer, in writing, before submitting his bid.

2.2 INTERRUPTION OF SERVICE

A. Changes in service shall be made so as to provide a minimum of interference with the operation of services in the building. When changes require shutdown of building services, notify the proper building authorities no less than 48 hours in advance and obtain approval from these authorities before making changes. Such notices shall give duration and nature of shutdown. Temporary arrangements shall be approved by the Architect/Engineer and/or Owner.

B. Any and all interruptions to building services shall be in accordance with Division 01 - General Requirements.

2.3 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping at indicated slopes.

F. Install fittings for changes in direction and branch connections.

G. Install piping to allow application of insulation.

H. Select system components with pressure rating equal to or greater than system operating pressure.

2.4 OPENINGS, CUTTING, AND PATCHING

A. The General Contractor shall coordinate the placing of openings in the new structure, as required for the installation of the plumbing work.

B. Furnish to the General Contractor the accurate locations and sizes for required openings. This shall not relieve this Contractor of the responsibility of checking to assure that proper size openings are provided. When additional patching is required due to this Contractor's failure to inspect this work, this Contractor shall make arrangements for the patching required to properly close the opening, to include patch painting. This Contractor shall pay any additional cost incurred in this respect.

C. When cutting and patching of the structure is made necessary due to this Contractor's failure to install piping, sleeves or equipment on schedule, or due to this Contractor's failure to furnish, on schedule, the information required for the leaving of openings, it shall be this Contractor's responsibility to make arrangements for this cutting and patching. This Contractor shall pay any additional cost incurred in this respect.

D. Provide cutting and patching and patch painting in the existing structure, as required for the installation of the work. Furnish lintels and supports as required for openings. Cutting of structural support members will not be permitted without prior approval of the Architect/Engineer. Extent of cutting shall be minimized. Use core drills, power saws or other machines which will provide neat, minimum openings. Patching shall match adjacent materials and textures and shall be performed by craftsmen skilled in the respective craft required.

E. Underfloor Plumbing Work:

1. Contractor shall coordinate all related activity with General Contractor at least 24 hours before beginning construction activity.
2. Contractor, before saw-cutting floor, must first field verify all existing piping service, sizes, locations, depths, flow directions as well as coordinate with any other trades who may have utilities such as wires or conduits concealed beneath floor and which may be subject to damage and subsequent service interruptions. The cost to repair any damaged utilities shall be borne by The Contractor.
3. Contractor shall be responsible for erecting and maintaining suitable temporary construction barriers and enclosures for containment of all construction dust and debris. Enclosures and barriers shall be maintained under negative pressure and fans and filters as needed to assist with containment.

2.5 EXCAVATION AND BACKFILL

A. Contractor shall coordinate all related activity with General Contractor at least 24 hours before beginning construction activity.

B. The Contractor shall be responsible for erecting and monitoring of all safety barricades and related protection around excavation and work areas.

C. Trenches and excavations may be backfilled by the Contractor only after required testing has been satisfactorily performed and locations of connections and appurtenances which will be concealed have been recorded by the Contractor in the construction record documents.

D. Bedding:

1. Sanitary Sewer Pipe Bedding Material:
   a. Rigid Pipe:
      1) Rigid gravity sanitary sewer pipe shall be provided with compacted granular bedding having a minimum thickness of 4" (100 mm) or 1/8th of the outside pipe diameter, whichever is greater.
      2) Clean gravel or crushed rock shall meet the following gradation for rigid sewer pipe. (RCP, DIP, VCP)
2. Sanitary sewer force mains may be installed with undisturbed or compacted soil bedding provided the subgrade is consistent and the Contractor provides hand excavation for bells such that the pipe barrel bears evenly on the subgrade.
3. Contractor shall be responsible for prompt cleanup and disposal of all unsuitable or excess bedding materials.

E. Backfill:

1. Suitable excavated material: Free of cinders, ashes, refuse, rocks, pavement fragments, vegetative or organic matter. Unless noted otherwise on the plans, sand shall not be used.
2. Granular backfill shall be crushed limestone or gravel with 100% passing a ¾" (19 mm) sieve, 50-80% passing a No. 4 (4.75 mm) sieve, and 25-60% passing a No. 8 (2.36 mm) sieve. (IADOT Gradation No. 10)
3. Place backfill simultaneously on both sides of pipe to prevent displacement and place at an angle so that impact on installed pipe is minimized.

4. Backfill in the pipe envelope (top of bedding to a point 12" (300 mm) above the pipe) shall be hand placed. Material shall be of even consistency and free of clumps and boulders, finely divided, and shall be compacted to 90% maximum Standard Proctor Density. Material within the pipe envelope shall be the same as specified for trench backfill, unless noted otherwise on the Plans
5. Contractor shall be responsible for prompt cleanup and disposal of all unsuitable or excess backfill materials.

2.6 CONCRETE AND MASONRY WORK

A. Concrete work included herein or shown on the drawings shall be in conformance with Division 3 - Concrete.

B. Concrete work included herein or shown on the drawings shall be done only by experienced cement finishers. Brickwork, where included, shall be laid only by experienced brick masons. Brick shall be of uniform size, hard burned, and shall be laid in cement mortar, except for patch work at a location where cement and lime mortar has previously been used. Exposed, finish brickwork shall match existing brickwork as closely as practical and shall be to the satisfaction of the Architect/Engineer and Owner.

C. Concrete bases and pads for plumbing equipment will be furnished by General Contractor. This Contractor shall coordinate size and location.

D. Concrete bases and pads for plumbing equipment shall be furnished by this Contractor. Size bases to extend minimum of 4" beyond equipment base in any direction, and 4" above finished floor elevation. Construct of reinforced concrete, roughen floor slab beneath base for bond, and provide steel rod anchors between floor and base. Locate anchor bolts using equipment manufacturer's templates. Chamfer top and edge corners.

E. Locate, furnish and install all support, hanger and equipment anchor bolts and related hardware.

F. Underfloor Plumbing Work:

1. Contractor shall coordinate all related activity with General Contractor at least 24 hours before beginning construction activity.
2. Contractor shall saw cut, remove and properly dispose of concrete and related debris as required to accommodate new underfloor piping and fixtures.
3. Patch floor to match adjacent floor textures and reinforce with #3 rebar, 18” O.C. (drill and grout 3” imbed).
4. Unless noted otherwise, concrete shall be commercial grade with a minimum 28-day compressive strength of 3,000 PSI. Do not allow air content of troweled finished floors to exceed 3%

2.7 ROOF OPENINGS

A. Roof openings required by this Contractor that are not shown on the Structural or Architectural Drawings shall be cut and adequately reinforced by an experienced roofing contractor.

B. Roof penetrations for piping shall be through curbed roof openings. Equipment supports shall be by curbed and flashed runners meeting current National Roofing Contractor Association (NRCA) standards and details. Pitch pockets, pitch pans, and wood blocking are not acceptable.

C. All roof work shall be completed such that it does not void any existing roof warranty.

2.8 PAINTING

A. The finish of any item that has been marred, scratched or damaged in any way by this Contractor shall be repainted at the expense of this Contractor, and to the satisfaction of the Architect/Engineer and the Owner.

B. Painting and finishing of exposed mechanical systems including piping and duct shall be as shown on the drawings and per Division 9 - Finishes.

2.9 CLEANING

A. Keep the premises clean of all dirt and debris, caused by the work in accordance with Division 1 - General Requirements.

B. Keep the premises clean of all debris caused by the work at all times, and keep materials stored, in areas designated by the Owner, in such a manner as not to interfere with the progress of the work of other Contractors or with the operation of existing facilities.

C. At the conclusion of the construction, the site shall be thoroughly cleaned of all rubble, debris and unused material and shall be left in good order. Closed off spaces shall be cleaned of waste such as material, cartons, and wood frame members used in the construction.

2.10 SUSPENSION FROM WOOD STRUCTURAL MEMBERS

A. In general, concentrated or other loads shall not be suspended directly from the bottom of wood structural members, unless approved by the Architect/Engineer. Loads suspended from open web joists or trusses may be transferred to the bottom chord of the structural member at the panel points. Loads suspended from solid web joists shall be transferred to the joists only through the top flange or web. Suspension systems shall be reviewed by the Architect/Engineer.

2.11 WIRING FOR PLUMBING EQUIPMENT

A. The Division 26 Contractor shall provide power including connection to all electrically powered equipment furnished by the Division 22 Contractor. Where electrical disconnect switches are not explicitly specified to be furnished as part of Division 22 equipment, the Electrical Contractor shall furnish suitable type(s) and properly rated electrical disconnect switches for all said mechanical equipment.

B. Provide integral wiring, alarm wiring, control wiring, temperature control wiring and interlock wiring for equipment furnished, whether or not such wiring is furnished by the equipment vendor.

C. Except as noted otherwise or where other sections call for motor starters to be furnished by manufacturers as part of their equipment, the Division 26 Electrical Contractor shall furnish motor starters as required for motors furnished by this Division 22 Contractor.

D. Furnish shop drawings including but not limited to detailed schedules and wiring diagrams to other interested trades including Division 26 electrical contractor for all electrically powered equipment furnished. Schedules shall include: electrical loads and characteristics, max. overcurrent fuse protection / circuit breaker needs, disconnect requirements, motor starter requirements and motor horsepower(s). Include drawings as needed to depict locations of electrical and control panels, service clearances, disconnects as well as wiring connection points.

E. The Division 22 Contractor shall be responsible to pay for all additional costs incurred due to equipment substitutions by Division 22 Contractor, which require either larger electrical service or service of a different electrical characteristic than scheduled on the Drawings.

F. Prior to bid submission, this Division 22 Contractor shall review the Electrical Drawings and promptly bring to the attention of the Architect/Engineer, any omissions or errors in the electrical services required for equipment proposed to be furnished.

2.12 PROTECTION

A. Special steps shall be taken as necessary for the protection of equipment and materials furnished under Division 22. Equipment and materials shall be protected by Contractor from any physical damage due to weather elements, dirt, dents, sheet rock installation, and painting until the project is completed. Damage, if incurred, shall be promptly repaired at no additional cost to Owner, as-needed to restore equipment and materials to original as-new condition.

B. Protection of equipment during the finishing (sheet rock, plastering and painting) of the building interior shall be the responsibility of the contractor or contractors performing that work. This shall not relieve this Division 22 Contractor of the ultimate responsibility of checking and ensuring that adequate protection is provided and maintained at all times.

C. Where the installation or connection of equipment requires Division 22 Contractor to work in areas previously finished by other Contractors, the Division 22 Contractor shall be responsible to ensure that such finished areas are adequately protected and are not marred, soiled or otherwise damaged during the course of their said work. If damage occurs this Division 22 Contractor shall be responsible to arrange for the other Contractors to repair and refinish any damaged areas and shall pay for all repair, rework and refinishing required.

D. When heavy materials must be placed upon or transported over the roof deck, sheeting shall be placed to distribute the weight and support such materials. Any damage shall be immediately corrected at no cost to the Owner.

2.13 NOISE AND VIBRATION

A. Contractor shall install all equipment in a such a manner so as to control the transmission of noise and vibration from any installed equipment, components or systems, so the sound level in any occupied area does not exceed NC-35 levels. Contractor shall correct all objectionable noise levels in any occupied areas and at no additional cost to Owner, which are due to improperly installed or isolated equipment, components or systems.

2.14 TESTS AND DEMONSTRATIONS

A. Systems shall be tested and placed in proper working order prior to demonstrating systems to the Owner.

B. Prior to acceptance of the plumbing installation, demonstrate to the Owner or his designated representative’s essential features and functions of all systems installed, and instruct the Owner in the proper operation and maintenance of such systems.

C. Furnish the necessary trained personnel to perform the demonstrations and instructions, and arrange to have the manufacturer's representatives for the system present to assist with the demonstrations. The Owner and Contractor shall each sign a certification stating that the training has been performed and the Owner accepts same.

2.15 UTILITY REBATE APPLICATIONS

A. This contractor shall be responsible for gathering information necessary for completing local utility rebate applications, and submitting to the proper utility companies for gas and electric rebates. Potential rebates include high efficiency gas boilers, thermostats, timeclocks, motors, and other items furnished by this plumbing contractor.

END OF SECTION

SECTION 22 0519
METERS AND GAUGES FOR PLUMBING PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Provide equipment, materials, labor, and supervision necessary to install thermometers and gauges.

B. Thermometers

C. Thermometer Wells

D. Gauges

1.2 REFERENCE STANDARDS

A. ASME B40.100 - Pressure Gauges and Gauge Attachments; The American Society of Mechanical Engineers; 2013.

B. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers; 2014.

C. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers; 2007.

1.3 QUALIFICATIONS

A. Thermometers: Weiss, Weksler, Ashcroft, Reotemp, U.S. Gauge or Therice.

B. Gauges: Weiss, Weksler, Ashcroft, McDaniel, U.S. Gauge or Therice.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's product and installation data. Provide list that indicates use, operating range, total range and location for manufactured components.

PART 2 PRODUCTS

2.1 THERMOMETERS

A. Stem Type:

1. 9 in. "Adjust-Angle" industrial thermometer, complete with double thick glass front, non-toxic blue ribbon liquid, separable socket and arranged so the unit can be set at any required angle front to back or left to right during or after installation. Range 32 F - 240 F for hot water, 50 F - 400 F for steam, and 0 F - 100 F for chilled or domestic cold water.

B. Dial Type:

1. 4-inch diameter, all stainless steel hermetically sealed per ASME B40.3, stainless steel stem, head and bezel. Coordinate stem length with system served. Bi-metal coil sensor, aluminum dial with black markings, glass lens, 1% full scale accuracy. Range 20 deg F - 240 deg F for hot water, 0 deg F - 100 deg F for domestic cold water.

2.2 GAUGES

A. 4 in. compound pressure vacuum gauge, liquid filled, aluminum, steel or stainless steel case, white dial, 1/4-in. male NPT. Range 30 in. vacuum to 100 pound pressure for water, 30 in. vacuum to 30 pound pressure for low pressure steam, 30 in. vacuum to 1-1/2 times system pressure for medium and high pressure steam. Provide siphon (pigtail) for steam gauges. Provide level handle union cock for steam and water gauges.

2.3 THERMOMETER WELLS

A. Provide thermometer wells constructed of brass or stainless steel, pressure rated to match piping system design pressure. Provide 2" extension for insulated piping. Provide cap nut with chain fastened permanently to thermometer well.

B. Manufacturer: Same as thermometers.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install thermometers in discharge and hot water recirculation return piping at water heaters, and at other points as shown on the Drawings.

B. Install gauge for each pump, mounted on 1/4 in. galvanized steel pipe manifold connected to the suction and discharge of the pump, with lever handle union cocks in the manifold on each side of the gauge, so that the gauge may be opened to either the suction or discharge pressure.

C. Install gauges at pressure reducing valves and at other points as shown on the Drawings.

END OF SECTION

SECTION 22 0523
GENERAL DUTY VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES:

A. Provide equipment, materials, labor, and supervision necessary to install valves as indicated on drawings and in schedules, and herein specified.

B. As nearly as possible, all valves shall be of a single manufacturer.

C. Valves shall conform to ANSI standard dimensions.

D. ASME Compliance:

1. ASME B16.10 for ferrous valve dimensions.
2. ASME B31.9 for building services piping valves.

E. NSF Compliance: NSF/ANSI 61 and/or NSF/ANSI 372 for valve materials for potable-water service. Valves for domestic water must be 3rd Party Certified.

1.2 SUBMITTALS

A. Submit detailed Shop Drawings and Product Data clearly indicating manufacturer, model, size, dimensions and pressure rating.

B. For records documentation submit valve schedule, indicating valve ID, type, size and intended service and location.

1.3 PACKAGING

A. Valves shall be furnished or provided with protective packaging to prevent damage during shipping or on the job site.

B. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set angle, and globe valves closed to prevent rattling.
4. Set ball and plug valves open to minimize exposure of functional surfaces.
5. Set butterfly valves closed or slightly open.
6. Block check valves in either closed or open position.

C. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

D. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 PRODUCTS

2.1 GENERAL

A. Materials: Discs, gaskets, packings, seats, diaphragms and lubricants shall conform to recommendations of the valve manufacturer for the intended use.

B. Body materials, unless otherwise stated:

1. Bronze: 125-150 lbs., ASTM B62
2. High Grade Steam-Metal or Valve-Bronze Alloy: 200-300 lbs., ASTM B61
3. Cast Iron: ASTM A126, Class B
4. Ductile Iron: ASTM A395, A536
5. Cast Steel: ASTM A216

C. Lead Free silicon bronze (ASTM listed) valves shall be made with corrosion-resistant materials. Manufacturer shall provide third party certification tested in accordance with EN ISO 6509 regarding dezincification corrosion resistance and stress corrosion cracking.

D. Bronze Valves: NPS 2 (DN 50) and smaller with threaded or solder ends, unless otherwise indicated.

E. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

F. Valve Sizes: Same as upstream piping unless otherwise indicated.

G. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Grooved: With grooves according to AWAA C606.
3. Solder Joint: With sockets according to ASME B16.18.
4. Threaded: With threads according to ASME B1.20.1.
5. Copper Press: With sockets according to ASME B16.22/ASTM B75.

H. Valves in Insulated Piping: With 2-inch stem extensions and the following features:

1. Ball Valves: With extended operating handle of non-thermal-conductive material that meets UL 2043 approved for inside air plenum, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation and memory stops that are fully adjustable after insulation is applied.
2. Butterfly Valves: Shall have 2” extended neck for insulation clearance.
3. Gate Valves: With rising stem.

2.2 MANUFACTURERS

A. Subject to compliance with requirements, provide products manufactured by one of the following, as listed for each valve type, or Engineer-approved equivalent.

Valve Type	Approved Manufacturer
Gate, Globe, and Check Valves	Crane, Stockham, Lunkenheimer, Hammond Industrial Series, NIBCO, Milwaukee
Ball Valves	Jamesbury, Apollo, Jenkins, Milwaukee, Watts, Worchester, Powell, or NIBCO

Butterfly Valves	Lined: Keystone, Demco, Milwaukee, Centerline, Nibco High Performance: Jamesbury, Dezurik, Durco
Plug Valves	Flowserve-Nordstrom, Stockham, Dezurik, W-K-M
Automatic Valves	ASCO, Skinner, Clayton, Parker
PVC and CPVC Valves	ASAHI/America, Watts, or Nibco

2.3 GATE VALVES

A. Provide gate valves complying with MSS SP-70 or MSS SP-80. Gate valves shall be as follows unless otherwise indicated on the drawings.

1. 2 in. and Smaller: 125-lb. saturated steam, screwed, solid wedge disc, and all parts ASTM B62 grade bronze except wheel and packing.
2. 2-1/2 in. through 16 in.: 125-lb. saturated steam, O.S.&Y., flanged ends, bronze seats and stem, double-seated solid wedge disc, iron body and bonnet.

B. Equip valves with packing suitable for intended service.

C. Provide gate valves designed such that back seating protects packing and stem threads from fluid when valve is fully opened. Equip valves with gland follower.

D. Gate valves used for ASME Section IV vessel isolation valves shall have adjustable type packing gland.

2.4 CHECK VALVES

A. Provide check valves complying with MSS SP-71 or MSS SP-80 for water, steam, and air shall be as follows unless otherwise shown on the drawings:

1. 3 in. and smaller: 200-lb. saturated steam, swing type, threaded, bronze body meeting ASTM B62, pressure tight removable disc, hinge bumper to prevent sticking open, can be mounted horizontally or vertically.
2. Over 3 in.: 125-lb. saturated steam, swing check, flanged iron body meeting ASTM A126 Class B design to prevent disc sticking open, removable disc, bronze trimmed for steam or water, otherwise all iron construction.
3. Non-slam type for pump discharge duty – 2-1/2 in. and larger: I.B.B.M., flanged, class 300, wafer style.
4. Lift check type for boiler feed - 2 in. and smaller: 125-lb. saturated steam, ball cone, check valve with threaded bronze body and spring-loaded seating action.

2.5 BALL VALVES

A. Provide ball valves complying with MSS SP-72 or MSS SP-110. Ball valves shall be as follows unless otherwise indicated on the drawings.

1. 2 in. and smaller: ASTM B584 bronze body, 2-piece, full port stainless steel brass ball, screwed or soldered ends with teflon seats and seals, blow out proof stem, tee or lever handle rated to 150 SWP/600WOG.
2. 2 in. and smaller for medical gas systems: ASTM B62 forged brass or bronze body, 3-piece, full port, stainless steel ball, soldered ends with Teflon seats and seals, lever handle.

3. Over 2 in.: ASTM A2116 carbon semi-steel or ASTM A536 ductile iron body, 2-piece, full port stainless steel brass ball, ANSI rated flanged ends with teflon seats and lever handle rated to 150 SWP/600WOG.

B. CPVC and PVC ball valves shall be union type, full port, schedule 80.

2.6 ACTUATORS, HANDWHEELS, OPERATORS, HANDLES, AND WRENCHES

A. Provide suitable handwheels for gate, globe and drain valves.

B. Valve Actuator Types:

1. Gear Actuator: For quarter-turn valves NPS 8 (ND 200) and larger.
2. Handwheel: For valves other than quarter-turn types.
3. Hand lever: For quarter-turn valves NPS 6 (DN 150) and smaller.
4. Chainwheels: Valve actuation assembly with sprocket rim, brackets, and chain for mounting height.

C. Provide one plug valve wrench for every 10 plug valves sized 2 in. and smaller, minimum of one. Provide each plug valve, sized over 2 in. with a wrench, with set screw.

PART 3 EXECUTION

3.1 VALVE LOCATIONS – GENERAL

A. Unless otherwise noted, shutoff valves shall be provided at all equipment connections (supply and return where applicable) for the following piping: pump suction and discharge, water, air, fuel and gas and drain lines (except on gravity drains from pans). Equipment connections include such items as tanks, pumps, heat exchangers, and similar items.

B. Check valves of the non-slam type shall be installed at the discharge of pumps unless otherwise shown on the drawings.

C. Install isolation valves at each branch off of horizontal mains and vertical risers.

D. All valves 4 in. and larger used for dead end service (future connections) shall be butterfly type (high performance), lugged style with tapped holes in a wafer body.

E. Install chainwheels on operator for ball and gate valves NPS 4 (DN 100) and larger and more than 96 inches (2400 mm) above floor or more than three feet above ceiling. Extend chains to 60 inches (1520 mm) above finished floor or just above ceiling.

3.2 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent this movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.3 VALVE INSTALLATION

A. Follow the manufacturer's recommended installation instructions concerning soldering, silver brazing, welding, threading, and installation of flanged valves in order to prevent damage to the valve and assure its maximum efficiency. Additional specific installation requirements are as follows:

1. Thread pipe for threaded valves to standard length only, using new block dies.
2. Put pipe compound on the pipe end, not into the valve threads. Securely screw pipe and valve together.
3. Blow out or otherwise thoroughly clean pipe sections before they are installed.
4. Close valve before installation.
5. Secure and adjust valves for no leaks and for easy operation.
6. Install valves with stems horizontal or vertical above the pipe and square with building construction. Install valves in position to allow full stem movement.
7. Install valves so piping does not place a stress or strain on the valve body. Locate valves for easy access and provide separate support where necessary.
8. Install extended-stem valves where insulation is indicated. Stems shall be extended such that the handle moves freely without contact with the insulation.
9. Install drain valves at low points of piping, at each mechanical equipment item, and elsewhere, where indicated.
10. Locate valves, cock, and hose bibbs to allow easy accessibility for operation, maintenance and repair.
11. Lugged butterfly valves with rubber-lined seats shall be installed with the disc(s) partially open. Bolts shall be torqued to the manufacturer’s recommendations.

B. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

C. Install check valves for proper direction of flow and as follows:

1. Swing Check Valves: In horizontal position with hinge pin level.
2. Lift Check Valves: With stem upright and plumb.

D. When soldering use paste fluxes that are approved by the manufacturer for use with Lead Free Alloys.

3.4 PROVISION FOR WRENCHES

A. One operating wrench shall be provided for every 10 valves of each type not equipped with handwheels or levers. A minimum of two wrenches shall be provided for each type of valve.

3.5 SPECIAL OPERATORS FOR 1/4 TURN PRODUCTS

A. Special slow closing operators shall be provided for quick closing valves to prevent the destructive fluid action of "water hammer" effects.

1. Steam under 50 PSI and incompressible fluids: As recommended by the manufacturer.

3.6 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.7 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. Drawings indicate valve types to be used. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball, Butterfly, or Gate valves.
    a. Piping NPS 2 (DN 50) and smaller: Furnish bronze ball or gate valves.
    b. Piping NPS 2-1/2 (DN 65) and larger: Furnish cast-iron butterfly or gate valves with flanged ends.
2. Throttling - Balancing Service: Globe, Ball, or Butterfly valves.
    a. Piping NPS 2 (DN 50) and smaller: Furnish bronze ball or globe valves.
    b. Piping NPS 2-1/2 (DN 65) and larger: Furnish cast-iron butterfly valves with flanged ends.
3. Hot-Water Piping, Balancing Duty: Memory-stop balancing valves.
4. Drain Duty: Hose-end drain valves.
5. Cast-iron, grooved-end valves may be used with grooved-end piping.
6. PVC and CPVC ball, butterfly and check valves may be used in matching piping materials.
7. Butterfly Valve Dead-End Service: Single-flange (lug) type.
8. Pump-Discharge Check Valves:
    a. NPS 2 (DN 50) and Smaller: Spring-loaded lift valves with nonmetallic disc.
    b. NPS 2-1/2 (DN 65) and Larger for Domestic Water: Center-guided metal-seat check valves.

B. Install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have supply stops. Use ball or gate valves for piping NPS 2 (DN 50) and smaller. Use butterfly or gate valves for piping NPS 2-1/2 (DN 65) and larger.

C. Install drain valves for equipment at base of each water riser, at low points in horizontal piping, and where required to drain water piping.

1. Install hose-end drain valves at low points in water mains, risers, and branches.
2. Install stop-and-waste drain valves where indicated.

D. Install balancing valve in each hot-water circulation return branch and discharge side of each pump and circulator. Set balancing valves partly open to restrict but not stop flow. Use ball valves for piping NPS 2 (DN 50) and smaller and butterfly valves for piping NPS 2-1/2 (DN 65) and larger. Balancing valves are specified in Division 22 Section "Domestic Water Piping Specialties."

E. Install calibrated balancing valves in each hot-water circulation return branch and discharge side of each pump and circulator. Set calibrated balancing valves partly open to restrict but not stop flow. Calibrated balancing valves are specified in Division 22 Section "Domestic Water Piping Specialties."

F. If valves with specified CWP ratings are not available, the same types of valves with CWP ratings may be substituted.

G. Select valves, except wafer types, with the following end connections:

1. For Copper Tubing, NPS 2 (DN 50) and Smaller: Threaded, Sweat solder, or Press-to-fit ends.
2. For Copper Tubing, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Grooved Mechanical Coupling, Flanged, or Threaded ends .
3. For Copper Tubing, NPS 5 (DN 125) and Larger: Grooved Mechanical Coupling or Flanged ends.
4. For Steel Piping, NPS 2 (DN 50) and Smaller: Threaded or Welded ends.
5. For Steel Piping, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Grooved Mechanical Coupling, Welded , or Flanged ends.
6. For Steel Piping, NPS 5 (DN 125) and Larger: Grooved Mechanical Coupling, Flanged, or Welded ends.

3.8 VALVE SCHEDULE

Valve Type	Service
Gate - All Sizes	Domestic cold, hot and recirculating systems; for operation up to 200 psi at 500° F. For applications where ball valves are not suitable.
Check - All Sizes	Water, air and steam for process piping systems.
Ball - 2 in. and Under	Domestic cold water, hot, and recirculating systems; for operation up to 200 psi at 500° F.
Boiler and Pressure Vessel Isolation	Isolation valves for ASME section IV stamped pressure vessels shall be a gate type with an adjustable-type packing gland.

END OF SECTION

SECTION 22 0529
HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Provide equipment, materials, labor and supervision necessary to install pipe hangers and supports.

B. Pipe support systems shall secure pipes in place, prevent pipe vibration, provide vertical adjustment for maintaining required grades, and provide for expansion and contraction.

C. Where supports are attached to concrete or other structural members, care shall be taken to prevent damage or weakening of the structural members.

D. Where concrete inserts are to be used, it shall be this Contractor's responsibility to accurately locate and attach inserts to concrete forms.

1.2 REFERENCE STANDARDS

A. American National Standards Institute, ANSI:

1. ANSI B31.1 Power Piping
2. ANSI B31.9 Building Services Piping

B. Manufacturers Standardization Society of the Valve and Fittings Industry, MSS, 1815 North Fort Myer Drive, Arlington, VA 22209.

1. MSS SP-58: Pipe Hangers and Supports - Materials, Design and Manufacturer.
2. MSS SP-69: Pipe Hangers and Supports - Selection and Application.

C. Anvil International, 2 Holland Way, Exeter, NH 03833, www.anvilintl.com, (603) 418-2800.

1. Pipe Hangers and Supports Catalog (Jan. 2015)

1.3 DEFINITIONS

A. Pipe Hanger: A device normally suspended from structure and is used to carry the piping weight in tension.

B. Pipe Support: A device by which piping is normally carried from beneath and is used to carry the piping weight in compression.

1.4 SUBMITTALS

A. Submit manufacturer's product data on all hangers and support devices. Product data to include, but not be limited to materials, finishes, approvals, load ratings, and dimensional information.

PART 2 PRODUCTS

2.1 HANGERS AND SUPPORTS

A. Hangers and support devices shall be Anvil International Inc., Tolco, Fee and Mason, Michigan, B-Line or Engineer approved equivalent. Figure numbers within are based on Anvil International, Inc..

PART 3 EXECUTION

3.1 INSTALLATION - HORIZONTAL PIPE SUPPORTS

A. Hanger rods for steel, wrought iron and brass pipe shall be installed in accordance with MSS SP-69 Tables 3 and 4 and the following schedule:

Pipe Size	Rod Diameter	Maximum Spacing
Up to 1 1/4"	3/8"	7'-0"
1 1/2" and 2"	3/8"	9'-0"
2"	3/8"	10'-0"

B. Hanger rods for copper pipe and tube shall be installed in accordance with MSS-SP-69 Tables 3 and 4 and the following schedule:

Pipe Size	Rod Diameter	Maximum Spacing
1/2" and 3/4"	3/8"	5'-0"
1"	3/8"	6'-0"
1 1/4"	3/8"	7'-0"

C. Support horizontal cast iron soil pipe with two hangers for each pipe length. Locate hangers close to couplings.

D. In addition to the above specified spacings, install additional hangers at change in pipe direction and at concentrated loads, large valves and strainers.

E. Where more than one pipe is to be run parallel together, they may be supported on trapeze type hangers. Trapeze bar angles and hanger rods shall be of sufficient size to support the particular group of pipes. Trapeze hanger spacing shall be based on the smallest pipe on the rack. When hanging from light gauge metal trusses, coordinate pipe hanger spacing and hanger rod connection points with the truss manufacturer.

F. For suspending hanger rods from brackets attached to walls, use welded steel brackets: Fig. 194 for loads up to 750 lbs; Fig. 195 for loads up to 1500 lbs; Fig. 199 for loads up to 3000 lbs.

G. Where pipes are to be racked along walls, use " Unistrut" pipe racks or 12 gauge steel strut channel, 1-5/8" x 1-5/8" minimum.

1. Mount pipes to strut channel with two-piece pipe straps to match outside diameter of pipe including insulation.

H. Attach all pipe hangers from support rods using double locknuts tightened to prevent loosening.

3.2 INSTALLATION - VERTICAL PIPE SUPPORTS

A. Support vertical steel, wrought iron, copper and brass pipe at every other floor line.

B. Support vertical cast iron soil pipe at every floor line.

C. In addition to the above, support vertical pipes at base of riser with base fitting set on concrete or brick pier, or by hanger located on horizontal connection close to riser.

D. Where pipe sleeves extend above floor, place pipe clamps at ceiling below and support clamp extensions from inserts or other approved attachment.

3.3 PIPE ATTACHMENTS

A. For horizontal steel and wrought iron pipe, use carbon steel adjustable clevis hanger, Fig. 260. For floor support or support directly above steel beams, use adjustable pipe roll stand, Fig. 177.

B. For horizontal copper pipe and tube, use copper-plated, carbon steel adjustable swivel ring, Fig. CT-69.

C. When thermal expansion for horizontal pipe is in excess of ½" axially, use adjustable steel yoke pipe roll, Fig. 181, or adjustable pipe roll stand, Fig. 177.

D. For horizontal cast iron soil pipe, use carbon steel adjustable clevis hanger, Fig. 260.

E. For vertical steel, wrought iron and cast iron pipe, use extension pipe or riser clamps, Fig. 261.

F. For vertical copper pipe and tube, use copper-plated, copper plated copper tubing riser pipe clamp, Fig. CT-121.

3.4 INTERMEDIATE ATTACHMENTS

A. Hanger rods: Carbon steel single or double end threaded, Figs. 140, 253 as required. Continuous threaded rod, Fig. 146 may be used wherever possible.

B. Chain wire or perforated strap hangers will not be permitted. One pipe shall not be suspended from another pipe.

3.5 STRUCTURAL ATTACHMENTS

A. For attaching steel or copper plated hanger rods to reinforced concrete, use galvanized malleable iron universal concrete inserts; Fig. 282 for loads up to 1140 lbs.

B. For attaching steel hanger rods to structural steel beams, use malleable iron C-clamps; Fig. 92, Fig. 93 or Fig. 94 with retaining clip Fig. 89 or Fig. 89X for loads up to 500 lbs; Fig. 218 with extension piece for loads up to 1,365 lbs. For copper plated hanger rods, use copper plated malleable iron C-clamps; Fig. CT-138R for loads up to 180 lbs.

C. For attaching steel hanger rods to wood structural members, use malleable iron ceiling flange; Fig. 153 for loads up to 1,270 lbs. For copper plated hanger rods, use copper plated malleable iron ceiling flange: Fig. CT-128R for loads up to 180 lbs.

D. Vertical expansion shields or toggles shall not be used for suspending hanger rods, except with permission in cases where inserts have been omitted or cannot be used. If permitted, use expansion shields; for rod sizes up to ½", 320 lbs. max. load. For hanger rods larger than ½" use attachment plate, Fig. 52, with wedge anchors.

E. Powder actuated anchoring methods shall not be used.

3.6 PIPE COVERING PROTECTION

A. Hangers and supports for insulated piping shall not injure or pierce insulation. Provide insulation protection shields in conjunction with hanger or roll device. Use Fig. 160 and 165, Protection Saddles.

3.7 SUPPLEMENTAL STEEL

A. Provide supplemental steel as required to hang or support plumbing equipment or piping.

END OF SECTION

SECTION 22 0533
HEAT TRACING FOR PLUMBING PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Self-regulating parallel resistance electric heating cable.

B. Cable outer jacket markings.

C. Connection kits.

D. Accessories.

E. Controls.

1.2 RELATED REQUIREMENTS

A. Section 22 0553 - Identification for Plumbing Piping and Equipment

B. Section 22 0700 - Plumbing Insulation.

1.3 REFERENCE STANDARDS

A. IEEE 515.1 - IEEE Standard for the Testing, Design, Installation, and Maintenance of Electrical Resistance Trace Heating for Commercial Applications; 2022.

B. ITS (DIR) - Directory of Listed Products; Current Edition.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

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

1.4 SUBMITTALS

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

B. Product Data: Provide data for electric heat tracing.

C. Shop Drawings: Indicate electric heat tracing layout, electrical terminations, thermostats, controls, and branch circuit connections.

D. Field Quality Control Submittals: Indicate test reports and inspection reports.

E. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions of equipment and controls, maintenance and repair data, and parts listings.

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

1.5 QUALITY ASSURANCE

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

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

1.6 WARRANTY

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

B. Provide two year manufacturer warranty for cables, connection kits, accessories, and controls.

PART 2 PRODUCTS

2.1 SELF-REGULATING PARALLEL RESISTANCE ELECTRIC HEATING CABLE

A. Manufacturers:

1. Chromalox, Inc:
2. Delta-Therm Corporation
3. Emerson Electric Co.
4. Raychem

B. Provide products listed, classified, and labeled by UL (DIR), ITS (DIR), or testing firm acceptable to authorities having jurisdiction (AHJ).

C. Factory Rating and Testing: Comply with IEEE 515.1.

D. Heating Element:

1. Provide pair of parallel No.16 nickel coated stranded copper bus wires embedded in cross linked conductive polymer core with varying heat output in response to temperature along its length.
2. Terminations: Waterproof, factory assembled, non-heating leads with connector at one end and water-tight seal at opposite end.
3. Capable of crossing over itself without overheating.

E. Insulated Jacket: Flame retardant polyolefin.

F. Cable Cover: Provide tinned copper and polyolefin outer jacket with UV inhibitor.

G. Maximum Power-On Operating Temperature: 150 degrees F (65 degrees C).

H. Maximum Power-Off Exposure Temperature: 185 degrees F (85 degrees C).

I. Electrical Characteristics:

1. 6 W/lineal ft (4" or less).

2.2 CABLE OUTER JACKET MARKINGS

A. Name of manufacturer, trademark, or other recognized symbol of identification.

B. Catalog number, reference number, or model.

C. Month and year of manufacture, date coding, applicable serial number, or equivalent.

D. Agency listing or approval.

2.3 CONNECTION KITS

A. Provide power connection, splice/tee, and end seal kits compatible with the heating cable and without requiring cutting of the cable core to expose bus wires.

B. Provide with NEMA 4X rating for prevention of corrosion and water ingress.

2.4 ACCESSORIES

A. Provide accessories as indicated or as required for complete installation, including but not limited to:

1. High temperature, glass filament tape for attachment of heating cable to metal piping.
2. Heat-conductive putty.
3. Cable ties.
4. Silicone end seals and splice kits.
5. Installation clips.
6. Warning labels for attachment to exterior of piping insulation. Refer to Section 22 0553.

2.5 CONTROLS

A. Pipe Mounted Thermostats:

1. Remote bulb unit with adjustable temperature range from 30 to 50 degrees F (minus one to 10 degrees C).
2. Snap-action, open-on-rise, single pole switch with minimum current rating adequate for the connected cable.
3. Remote bulb on capillary, resistance temperature device (RTD) or thermistor for direct sensing of pipe wall temperature.
4. Control Enclosure: Corrosion resistant and waterproof.

B. Programmable Controller:

1. Micro-processor based.
2. Capable of four separate schedules.
3. On/Off/Auto switch.
4. 365 day calendar with 20 programmable holidays.
5. Remote temperature sensor senses outside air temperature; programmable to energize the freeze-protection cable when temperature falls below 34 to 44 deg F.
6. Corrosion-proof and waterproof enclosure suitable for outdoor mounting, for controls and temperature sensors.
7. Minimum 30 A contactor to energize cable or close other contactors.
8. Ground-fault protection.
9. Single-point control of heat tracing for freeze protection.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that piping and equipment are ready to receive work.

B. Verify field measurements are as indicated on shop drawings.

C. Verify required power is available, in proper location, and ready for use.

3.2 PREPARATION

A. Clean exposed surfaces prior to installation.

B. Prepare surfaces using approved methods as recommended by manufacturer.

3.3 INSTALLATION

A. Install in accordance with manufacturer's written installation instructions.

B. Comply with installation requirements of IEEE 515.1 and NFPA 70, Article 427.

C. Apply heating cable linearly on pipe with fiberglass tape only after piping has successfully completed any required pressure testing.

D. Comply with applicable local building codes and requirements of authorities having jurisdiction.

E. Identification:

1. After thermal insulation installation, apply external pipeline decals to indicate presence of the thermal insulation cladding at intervals not to exceed 20 ft (6 m) including cladding over each valve or other equipment that may require maintenance.

3.4 FIELD QUALITY CONTROL

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

B. Perform start-up by factory technician or factory representative as per Owner's requirements.

C. Field Testing and Inspections:

1. Commission system in accordance with installation and operation manual.
2. Inspect for sources of water entry and proper sealing.
3. Inspect weather barrier to confirm that no sharp edges are contacting the trace heating.
4. Insulation Resistance: Greater than 20 megohms at a test voltage of 2500 VDC for polymer insulated trace heaters.
5. Test heating cable integrity with megohmmeter at the following intervals:
    a. Before installing the cable.
    b. After cable has been installed onto the piping.
    c. After installing the connection kits.
    d. After the installation of thermal insulation onto the piping.
    e. Prior to initial start-up (commissioning).
6. Measure voltage and current at each unit.
7. Controls:
    a. Verify control parameters are set to the application requirements.
    b. Verify factory provided digital temperature controller is correctly configured with the building automation system.

END OF SECTION

SECTION 22 0553
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Provide materials, equipment labor and supervision necessary to install piping identification products.

B. Comply with ANSI A13.1 for lettering size, length or color field, colors, and installed viewing angles of identification devices.

1.2 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; The American Society of Mechanical Engineers; 2007.

B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2013.

1.3 SUBMITTALS

A. Submit manufacturer's product data.

B. Submit sample of each type of identification product and clearly identify the contents in a schedule.

C. List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.

D. Schedule:

1. Submit valve schedule for each system, typewritten and reproduced on 8-1/2" x 11" bond paper. Tabulate valve ID tag number, system, system abbreviation (as shown on tag), location of valve (room or space), and variations for identification (if any). Mark valves that are intended for emergency shut-off and similar special uses, by special "flags" in margin of schedule.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Brady Corp., Industrial Safety Supply, Emedco, Seton or Brimar.

B. Engineer approved alternative

2.2 PIPE MARKERS

A. Provide manufacturer's standard preprinted, semi-rigid snap-on or self-sticking, color-coded pipe markers, complying with ANSI A13.1.

B. Provide full-band pipe markers, extending 360° around pipe at each location or self-sticking pipe markers, fastened in the following method:

1. Snap-on application of pre-tensioned semi-rigid plastic pipe marker.

2. Secure to piping and install banding tape on both ends of each pipe label.

C. Lettering shall be manufacturer's pre-printed nomenclature which best describes piping system in each instance, as selected by Architect/Engineer in cases of variance.

D. Print each pipe marker with arrows indicating direction of flow, integrally with piping system service lettering (to accommodate both directions), or as separate unit of plastic or on banding tape.

2.3 EQUIPMENT MARKERS

A. Provide engraved signage nameplates and tags constructed of multi-layered acrylic that has been treated for outdoor use and can withstand temperatures up to 160° F. Nameplates shall have beveled edges with contrasting color core, letters, and border. Minimum size of nameplate shall be 3" high by 6" long. The minimum letter height shall be 3/4". Attachment shall be by double faced 2 mil permanent acrylic adhesive. For equipment that doesn't allow for direct attachment, furnish sheet metal backing to integrate with equipment such that signage can be read from 5 feet above the finished floor. Unless noted otherwise, signage shall be provided with black lettering, black border, and yellow core. All signage shall include up to 14 characters per line, minimum of 3 lines per tag. Furnish signage for equipment shown in Section 3:

1. All pumps shall include the full name description for system served such as *"Primary Chilled Water Pump – 1."*

B. All equipment shall be named consistent with the plans and specifications as indicated on the schedules or as directed by the Owner.

2.4 BRASS VALVE TAGS

A. Provide manufacturer's standard brass valve tags with stamped black filled lettering, with piping system abbreviation in 1/4" high letters and sequenced valve numbers 1/2" high, and with 3/16" hole for fastener.

B. Provide 1-1/2" round brass tags with black lettering. Seton 250 BL or equal.

2.5 VALVE TAG FASTENERS

A. Manufacturer's standard solid brass chain or solid brass S-hooks of sizes required for proper attachment of tags to valves and manufactured specifically for that purpose.

2.6 PIPING AND EQUIPMENT IDENTIFICATION

A. Piping systems that shall be identified by their controls (including directional arrows) on this project shall include, but are not necessarily limited to the following:

1. Domestic cold water, hot water, and hot water recirculation.
2. Sanitary vent.

B. Provide name plates for all equipment scheduled on the drawings. Coordinate nameplate tag with Owner's sequencing system. If the Owner has no preference, the nameplates shall correspond with the equipment schedule. Equipment shall include but is not limited to the following:

1. Pumps.
2. Expansion tanks.
3. Water heaters.
4. Tanks.

PART 3 EXECUTION

3.1 INSTALLATION OF MECHANICAL IDENTIFICATION

A. Where identification is to be applied to surfaces that require insulation, painting or other covering or finish, including valve tags in finished mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.

B. Install pipe markers on each system, and include arrows to show normal direction of flow.

C. Locate pipe markers as follows: wherever piping is exposed to view in occupied spaces, machine rooms, accessible maintenance spaces (shafts, tunnels, plenums) above lay-in type ceilings and exterior non-concealed locations.

1. Near each valve and control device.
2. Near each branch, excluding short take-offs for fixtures, mark each pipe at branch where there could be question of flow pattern.
3. Near locations where pipes pass through walls or floors/ceilings, (both sides) or center non-accessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. At each pipe passage to underground.
7. Spaced intermediately at maximum spacing of 50 feet along each piping run, except reduce spacing to 25 feet in congested areas of piping and equipment.
8. On piping above removable acoustical ceilings, maximum spacing of 10 feet along each piping run.
9. Where self-sticking labels are used, the pipe or its covering surface shall be properly prepared. This consists of removal of loose dirt, oil and grease, loose paint or peeling insulation covering. This can be done with a brush and cloth; washing is not required. Use solvent for removal of oil or grease.
10. Banding tape must be used on both ends of all self-sticking labels. The tape shall encircle the pipe completely and overlap itself so the banding tape can adhere to itself.

D. Provide valve tags for all major valves 1/2" size or larger. Included are all main, zone and branch valves, valves in all equipment rooms, etc. All types of valves, ball, globe, butterfly, cocks, control, regulating, relief, reducing, solenoid, etc. are to be identified except check valves. Do not identify end use point valves for plumbing fixtures, and similar rough-in connections.

E. List each tagged valve in schedule for each system showing function and location. Provide separate charts for mechanical divisions of work. Charts shall be installed on a conspicuous wall in the main mechanical equipment room. Provide unframed copies of valve lists as part of closeout documents.

3.2 ADJUSTING AND CLEANING

A. Relocate any mechanical identification device which has become visually blocked by work of this division or by other divisions.

B. Clean face of identification devices and glass frames of valve schedules.

END OF SECTION

SECTION 22 0700
PLUMBING INSULATION

PART 1 GENERAL

1.1 CODES AND STANDARDS

A. Insulating materials, jackets and mastics shall meet flame spread, fuel contribution and smoke developed ratings in accordance with NFPA-90A. Flame spread rating in accordance with NFPA 255, ASTM E-84, or UL 723 of not more than 25; smoke developed rating of not more than 50, unless otherwise noted in this section.

B. Insulation that has been treated with a flame-retardant additive to meet the flame spread and smoke developed ratings shown above is not permitted.

C. Insulation materials shall be non-corrosive to the materials they are applied to, including stress corrosion cracking of stainless steel and shall not breed or promote mold, fungus or bacteria.

D. Insulation shall meet or exceed all requirements of ASHRAE/IES 90.1 - Energy Standard for Buildings Except Low-Rise Residential Buildings .

1.2 QUALIFICATION

A. Insulating materials by Owens-Corning, Armacell, Pittsburgh-Corning, Knauf, Johns Manville, or Engineer approved equivalent.

B. Mastics and adhesives as recommended by insulation manufacturer.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instructions for each type of mechanical insulation and jacket. Submit schedule showing manufacturer's product number, flame spread and smoke development rating, k-value, density, temperature limitations, sound absorption coefficients, thickness, and furnished accessories for each mechanical system requiring insulation.

PART 2 PRODUCTS

2.1 INSULATION

A. Description:

1. Type A: Preformed, sectional, heavy density fiberglass insulation, suitable for operating temperatures form - 20 F to +850 F. Equipped with factory-applied, all-service vapor barrier jacket constructed of white Kraft paper bonded to aluminum foil reinforced with fiberglass yarn, with pressure-sensitive, self-sealing longitudinal laps and butt strips. Thermal conductivity of 0.23 BTU-in/hr-ft2- F @ 75 F mean temperature. Water vapor permeance of 0.02 perms. Johns Manville "Micro-Lok HP or Engineer approved equivalent.

2.2 PIPE INSULATION SCHEDULE (IECC - INTERNATIONAL ENERGY CONSERVATION CODE)

SERVICE	TYPE	INSULATION THICKNESS	PIPE SIZE
Domestic cold water	A	1/2"	Less than 1 1/2"
		1"	1 1/2" and larger
Domestic hot water (up to 140°F) including hot water circ	A	1"	Less than 1 1/2"
		1 1/2"	1 1/2" and larger

2.3 INSULATION JACKETS

A. 20-mil high impact PVC secured with spray contact adhesive. All PVC jacketing shall meet the 25/50 SDR. Manville "Zeston 2000" or equivalent.

B. 6-oz/sq yd UL listed cotton canvas fabric secured with Childers CP50 lagging adhesive.

C. Fitting and valve jackets shall be premolded PVC with joints and seams sealed with a spray contact adhesive or vapor barrier mastic. Premolded jackets shall be Manville "Zeston 2000" or approved equivalent.

D. Where PVC or metal jackets are used, delete the factory applied ASJ on pipe and equipment operating above 75° F.

E. PVC jackets shall be used in the following areas and systems:

1. Whenever piping is routed exposed through occupied spaces.

PART 3 EXECUTION

3.1 GENERAL

A. Use only experienced applicators regularly engaged in the trade. Rough work will be rejected. Application details shall be in accordance with the insulation materials supplier's recommendations, except where a higher standard is specified.

B. Install materials after systems have been tested and approved. Material such as rust, scale, dirt and moisture shall be removed form surfaces to be insulated.

C. Insulation shall be kept clean and dry at all times.

D. Where pipes and ducts pass through fire rated walls, floors and partitions, a fire seal shall be provided.

3.2 PIPE INSULATION INSTALLATION

A. Insulate fittings, valves, unions, flanges, strainers, flexible connections and expansion joints with premolded or mitered segments of same insulating material as for adjacent pipe covering.

B. Pipe insulation shall continue through sleeves and hangers with vapor barrier and/or jacket.

C. Insert to be between support shield and piping but under the finish jacket. Provide an insert at hangars not less than 6 inches long, of same thickness and contour as adjoining insulation, to prevent insulation from sagging at support points. Inserts shall be heavy density insulating material suitable for the planned temperature range. Factory fabricated inserts may be used.

D. Neatly finish insulation at supports, protrusions and interruptions.

1. On hot systems where fittings are to be left exposed, insulation ends shall be beveled away from bolts for easy access.

2. On cold systems, valve stems shall be sealed with caulking which allows free movement of the stem, but provides a seal against moisture incursion.

E. Wherever piping penetrates a floor or is exposed in a finished area such as kitchens, furnish a floor pipe escutcheon and/or PVC (white) jacket to protect insulation and allow for a smooth finish for cleaning.

END OF SECTION

SECTION 22 1116
DOMESTIC WATER PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Provide equipment, materials, tools, labor, and supervision necessary to furnish, fabricate, and install complete piping system.

1.2 CODES AND STANDARDS

A. Pipe materials specified in this Section shall apply to technical sections of Division 22 of the Project Manual where applicable. Special requirements as may be called for in the technical sections, or shown on the Drawings, shall take precedence over General Requirements herein.

B. Lead Free: Refers to the wetted surface of pipe, fittings and fixtures in potable water systems that have a weighted average lead content =0.25% per Safe Drinking Water Act as amended January 4, 2011, Section 1417.

C. NSF Compliance: NSF/ANSI 61 and/or NSF/ANSI 372 for valve materials for potable-water service. Valves for domestic water must be 3rd Party Certified.

1.3 PRODUCT HANDLING

A. Provide factory-applied plastic end-caps on each length of pipe and tube. Maintain end-caps through shipping, storage, and handling as required to prevent pipe-end damage and eliminate dirt and moisture from inside of pipe and tube.

B. Where possible, store pipe and tube inside and protected from weather. Where necessary to store outside, elevate well above grade and enclose with durable, waterproof wrapping.

C. Protect flanges and fittings from moisture and dirt by inside storage and enclosure, or by packaging with durable, waterproof wrapping.

1.4 SUBMITTALS

A. For each system served: Submit piping schedule listing, by range of sizes, piping material used.

B. Submit manufacturer's specifications and/or catalog data including material and pressure test certifications for pipe, fittings, valves, and other related items including but not limited to pipe hangers and supports.

C. Locations of connections to existing water lines, service lines, valves, and water main appurtenances shall be submitted as a dimensioned drawing Owner's Representative or Architect/Engineer for construction record purposes.

PART 2 PRODUCTS

2.1 MATERIAL

A. Piping:

MATERIAL		SERVICE
Copper water tube, hard temper, ASTM B88	Type L	Aboveground domestic water piping lines.
PEX Tubing, ASTM F877		Above ground domestic water lines

B. Fittings:

1. Copper water tube, cast bronze or wrought copper, solder joint type. ANSI B16.18 and B16.22.

2.2 JOINTS

A. Welded pipe - welding shall conform to welding sections of ASME B31.1 "Code for Power Piping". Pipe up to 2" diameter shall be threaded and coupled and Pipe 2-1/2" diameter or larger shall be welded.

B. Copper water and drainage tube - use 95-5 tin antimony or silver solder, cut pipe square, clean and polish tube ends and inner surface of fittings, apply flux and solder joint as recommended by manufacturer of solder type fittings. Use same methods for copper refrigerant pipe, except use silver solder with 15% silver content, equivalent to Sil-Flos 15.

C. When soldering use paste fluxes that are approved by the manufacturer for use with Lead Free Alloys.

2.3 NIPPLES AND UNIONS

A. Nipples shall conform to size, weight, and strength of adjoining pipe. When length of unthreaded portion of nipple is less than 1-1/2", use extra strong nipple; do not use close nipples.

B. For pipe 3" and smaller, use screwed unions; over 3", use flanged unions. For steel and wrought iron pipe, use malleable iron ground joint unions, black or galvanized, to conform to pipe. Cast iron flanged unions are to be gasket type. For threaded brass pipe, use bronze ground joint unions with octagon ends. Install unions on equipment intended to be disassembled.

C. Dielectric unions shall be installed between connections of copper pipe and ferrous piping.

2.4 PIPE ESCUTCHEONS

A. Provide pipe escutcheons with inside diameter closely fitting pipe outside diameter, or outside of pipe insulation where pipe is insulated. Select outside diameter of escutcheon to completely cover pipe penetration hole in floors, walls, or ceilings; and pipe sleeve extensions, if any. Furnish pipe escutcheons with chrome finish for occupied areas, prime paint finish for unoccupied areas.

B. Pipe Escutcheons for Moist Areas: For waterproof floors, and areas where water and condensation can be expected to accumulate, provide cast brass or sheet brass escutcheons, solid or split hinged.

C. Pipe Escutcheons for Dry Areas: Provide sheet steel escutcheons, solid or split hinged.

D. Manufacturer: Chicago Specialty; Producers Specialty; or Sanitary-Dash.

2.5 FIRE SAFING

A. Metal piping and sleeves passing through floors, roof, partitions and fire walls, shall be provided with firestop by packing space between pipe and sleeve with UL listed non-sag and self-leveling fire safing insulation per manufacturer's instructions.

B. Plastic piping passing through fire rated floors and fire rated walls shall be provided with firestop by providing intumescent wrap strip around the pipe, enclosed in steel collar attached to structure.

C. Cracks, Voids, or Holes Up to 4" Diameter: Use non-sag or self-leveling putty or caulking, one-piece intumescent elastomer, non-corrosive to metal, compatible with synthetic cable jackets, and capable of expanding 10 times when exposed to flame or heat, UL listed.

D. Openings 4" or Greater: Use sealing system capable of passing 3-hour fire test in accordance with ASTM E814, consisting of wall wrap or liner, partitions, and end caps capable of expanding when exposed to temperatures of 250 to 350 degree F (121 to 177 degree C), UL listed.

E. Seal all holes or voids made by penetrations to ensure an effective barrier against smoke, fire, toxic and combustible gases.

F. Unless protected, from possible loading or traffic, install firestopping materials in floors having void openings or four (4) inches or more to support the same floor load requirements.

G. Manufacturer: Subject to compliance with requirements, provide non-sag and self-leveling fire barrier caulk, wrap/strip, moldable putty and sheet forms of one of the following:

1. 3M Brand.
2. Flame Stop.
3. Dow Corning.
4. Metacaulk.

H. Horizontal penetrations through fire rated walls where plenum rated cables or tubing bundles are being installed shall be made with EZ-Path Fire-rated Pathway by Specified Technologies, Inc.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install pipe for plumbing and mechanical systems as shown on the Drawings, as called for in other Sections, and as specified herein

B. Arrange and install piping approximately as indicated, straight, plumb, and as direct as possible, form right angles on parallel lines with building walls. Keep pipes close to walls, partitions, and ceilings, offsetting only where necessary to follow walls and avoid interference with other mechanical items. Locate groups of pipes parallel to each other; space at a distance to permit applying full insulation and to permit access for servicing valves. Piping to be run in concealed locations unless indicated exposed, or in equipment rooms.

C. Install horizontal piping as high as possible without sags or humps so that proper grades can be maintained for drainage. Branch piping shall come off the tops of mains unless shown otherwise.

D. Locate valves within reachable distance from equipment being served for easy access and operation. Do not locate valves with stems below horizontal.

E. Check piping for interference with other trades; avoid placing water pipes over electrical equipment.

F. Verify final equipment locations before roughing in.

G. Where rough-ins are required for equipment furnished by others, verify exact rough-in dimensions with Owner or equipment supplier before roughing-in.

H. Install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have supply stops. Use ball or gate valves for piping NPS 2 and smaller. Use butterfly or gate valves for piping NPS 2-1/2 and larger.

I. Install balancing valve in each hot-water circulation return branch and discharge side of each pump and circulator. Set balancing valves partly open to restrict but not stop flow. Use ball valves for piping NPS 2 and smaller and butterfly valves for piping NPS 2-1/2 and larger. Balancing valves are specified in Division 22 Section "Domestic Water Piping Specialties."

3.2 SLEEVES

A. Install sleeves for piping passing through floors, roof, walls and foundations.

B. Install fire-proofing per manufacturer's written instructions.

3.3 ESCUTCHEONS

A. Install escutcheons for pipes entering finished spaces.

3.4 PIPE PENETRATIONS

A. Penetrations shall be free of debris and dirt. Dam the penetration (when required) with an acceptable material. Apply firestop material to the penetration per manufacturer's installation instructions. Use a caulking gun, putty knife or other normal trade tools. Remove damming materials where necessary after cure. Clean up with Xylene.

3.5 FIRE SAFING

A. Install fire safing at all penetrations through walls, floors, etc. per manufacturer's installation instructions as required to meet UL listing.

3.6 FIELD QUALITY CONTROL

A. Inspect domestic water piping as follows:

1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.

2. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

   a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.

   b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

3. Re-inspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for re-inspection.

4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

B. Test domestic water piping as follows:

1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
4. Cap and subject piping to static water pressure of 50 psig (345 kPa) above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.7 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
   a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide flow of hot water in each branch.
   b. Adjust calibrated balancing valves to flows indicated.
5. Remove plugs used during testing of piping and plugs used for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.8 CLEANING

A. Domestic water piping shall be cleaned and disinfected prior to substantial completion. Immediately prior to occupancy, the system(s) shall be flushed and a water sample submitted to the local Water Works for testing.

B. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing domestic water piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction or, if methods are not prescribed, procedures described in either AWWA C651 or AWWA C652 or as described below:

a. Flush piping system with clean, potable water until dirty water does not appear at outlets.

b. Fill and isolate system according to either of the following:

1) Fill system or part thereof with water/chlorine solution with at least 50 ppm (50 mg/L) of chlorine. Isolate with valves and allow to stand for 24 hours.
2) Fill system or part thereof with water/chlorine solution with at least 200 ppm (200 mg/L) of chlorine. Isolate and allow to stand for three hours.
(a) Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
(b) Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

D. Prepare and submit reports of purging and disinfecting activities.

END OF SECTION

SECTION 22 1123
DOMESTIC WATER PUMPS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Circulators.

1.2 REFERENCE STANDARDS

A. ICC (IPC) - International Plumbing Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. NSF 61 - Drinking Water System Components - Health Effects; 2023, with Errata.

1.3 SUBMITTALS

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

B. Product Data:

1. Provide certified pump curve with duty point marked over pump and system operating conditions and NPSH curve and power requirement by pump tag.

C. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

PART 2 PRODUCTS

2.1 CIRCULATORS

A. Manufacturers:

1. Armstrong Fluid Technology
2. Bell & Gossett,
3. Grundfos Pumps Corporation
4. Taco, Inc.
5. Engineer approved equivalent.

B. Casing: Bronze with bronze cast impeller, and stainless steel rotor assembly.

C. Shaft: Alloy steel with integral thrust collar and two oil-lubricated bronze sleeve bearings.

D. Mechanical Seal: Carbon rotating against a stationary ceramic seat.

E. Pipe-End Connection: Union connection.

F. Maximum Discharge Pressure: 145 psi (1000 kPa).

PART 3 EXECUTION

3.1 INSTALLATION

A. Install products with related fittings, and accessories according to manufacturer instructions.

B. Potable and Drinking Water Service: Provide NSF 61 certified; comply with ICC (IPC).

C. Ensure that small pressure gauges are installed on both upstream and downstream ends.

D. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

3.2 FIELD QUALITY CONTROL

A. Operational Tests: Upon completion and sterilization of plumbing systems, conduct operating tests to demonstrate satisfactory, functional, and operating efficiency.

3.3 CLEANING

A. Thoroughly clean plumbing fixtures and equipment.

3.4 PROTECTION

A. Protect installed products from damage due from subsequent construction operations.

B. Repair or replace products damaged before Date of Substantial Completion.

END OF SECTION

SECTION 22 1316
SANITARY WASTE AND VENT PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Provide equipment, materials, tools, labor, and supervision necessary to furnish, fabricate, and install a complete soil, waste and vent system.

1.2 CODES AND STANDARDS

A. Pipe materials specified in this Section shall apply to other technical sections of Division 22 of the Project Manual where applicable. Special requirements as may be called for in the technical sections, or shown on the Drawings, shall take precedence over General Requirements herein. Piping located in plenums shall be plenum rated for fire and smoke.

B. Local and/or State Plumbing, Mechanical and Building Codes.

C. International Plumbing Code.

D. NFPA Codes and Standards.

1.3 PRODUCT HANDLING

A. Provide factory-applied plastic end-caps on each length of pipe and tube. Maintain end-caps through shipping, storage, and handling as required to prevent pipe-end damage and eliminate dirt and moisture from inside of pipe and tube.

B. Where possible, store pipe and tube inside and protected from weather. Where necessary to store outside, elevate well above grade and enclose with durable, waterproof wrapping.

C. Where possible, store pipe and tube inside and protected from weather. Where necessary to store outside, elevate well above grade and enclose with durable, waterproof wrapping.

1.4 SUBMITTALS

A. For each system served: Submit piping schedule listing, by range of sizes, piping material used.

B. Submit product and performance data for equipment specified herein

C. Locations of connections to existing sanitary sewer lines, storm water lines, and related invert elevations shall be submitted as a dimensioned drawing to the Owner's Representative or Architect/Engineer for construction record purposes.

PART 2 PRODUCTS

2.1 SANITARY SEWERS, SOIL, WASTE AND VENT MATERIALS

A. Piping:

MATERIAL	SERVICE
Cast iron soil pipe, service weight, no hub, CISPI 301, ASTM A888	Aboveground sanitary and storm sewers. Soil, waste, vent, and downspouts as permitted by code.

Copper water tube, Type M, hard temper, ASTM B88.	Aboveground soil, waste vent, and downspouts up to and including 3" diameter.
Copper drainage tube, hard temper, Type DWV. ASTM B306.	Aboveground soil, waste, vent, and downspouts up to and including 2-1/2" diameter, as permitted by Code.
Solid wall sched 40 PVC pipe ASTM D2665 drain waste and vent	Below ground soil, waste and vent piping.

B. Fittings

1. Material and strength of fittings for cast sewer pipes, clay sewer pipes, and concrete sewer pipe shall conform to pipe as per ASTM Standards.
2. Ductile iron and grey Iron fittings - Class 250, ANSI/AWWA C110 A21.10, standard mechanical joint fitting with lugs for connecting to pipe.
3. Copper drainage tube (M) - Cast bronze fittings, solder joint fittings. ANSI B.16, 23-69.
4. Solid wall Schedule 40 PVC DWV - solvent cemented joints per ASTM D2665.

C. Joints

1. Cast iron bell and spigot soil pipe - pipe manufacturer's standard preformed, preset plastic or rubber joint, installed in accordance with manufacturer's instructions.
2. Cast iron no-hub pipe - coupling assembly tightened by torque wrench.
    a. Conforming to ASTM C1540 Performance Requirements, CISPI 310, and NSF certified, type 300 series stainless steel shield secured by two or more stainless steel worm drive clamps, ASTM C564 gasket, one piece neoprene compression gasket.
    b. Manufacturers:
        1) Clamp All: Hi-Torq 80
        2) MG Coupling
        3) Ideal Tridon
        4) Engineer approved equivalent
3. Copper water and drainage tube - use 95-5 tin antimony or silver solder, cut pipe square, clean and polish tube ends and inner surface of fittings, apply flux and solder joint as recommended by manufacturer of solder type fittings. Use same methods for copper refrigerant pipe, except use silver solder with 15% silver content, equivalent to Sil-Flos 15.
4. Solid wall Schedule 40 PVC DWV - solvent cemented joints per ASTM D2665.

2.2 VENTS

A. Vents through the roof shall be cast iron and shall extend at least above the highest possible water level on the roof but in no case less than 12 inches.

B. Provide a flashing of 4 pound sheet lead for each vent through the roof. The flashing shall extend up around the pipe and turn down into it at least 2 in. and shall extend over the roof deck at least 1 ft. in each direction from the base.

C. Coordinate flashing of vents through the roof with General Contractor.

D. Where vents through the roof are subject to frost or snow closure the vent termination shall be increased beginning at least 12 in. under the roof with a cast iron long increaser. Size increasers as follows:

Vent Size	Increase To
2 in. and 2-1/2 in.	4 in. minimum

2.3 SLEEVES

A. Sleeves passing through non-load bearing walls and partitions shall be galvanized sheet steel with lock seam joints of minimum gauges as follows: For pipes 2-1/2" in size and smaller - 24-gauge; 3 in. to 6 in. - 22-gauge; over 6 in. - 20-gauge.

B. Sleeves passing through load bearing walls, concrete beams, fireproof walls, foundations, footings, and waterproof floors shall be Schedule 40 galvanized steel pipe or cast iron pipe.

C. Sleeves for insulated piping shall be of sufficient internal diameter to take pipe and insulation and to allow for free movement of pipe. Waterproof sleeves shall be of sufficient internal diameter to take pipe and waterproofing material.

D. In finished areas where pipes are exposed, sleeves shall be terminated flush with wall, partitions and ceilings, and shall extend 1/2 in. above finished floors. Extend sleeves 1 in. above finished floors in areas likely to entrap water and fill space between sleeves and pipe with graphite packing and caulking compound.

E. Sleeves passing through membrane waterproofing or roofing shall be flashed and sealed.

2.4 PIPE ESCUTCHEONS

A. Provide pipe escutcheons with inside diameter closely fitting pipe outside diameter, or outside of pipe insulation where pipe is insulated. Select outside diameter of escutcheon to completely cover pipe penetration hole in floors, walls, or ceilings; and pipe sleeve extensions, if any. Furnish pipe escutcheons with chrome finish for occupied areas, prime paint finish for unoccupied areas.

B. Pipe Escutcheons for Moist Areas: For waterproof floors, and areas where water and condensation can be expected to accumulate, provide cast brass or sheet brass escutcheons, solid or split hinged.

C. Pipe Escutcheons for Dry Areas: Provide sheet steel escutcheons, solid or split hinged.

D. Manufacturer: Chicago Specialty; Producers Specialty; or Sanitary-Dash.

2.5 GUARDS

A. Where exposed insulated piping extends through floor, provide sheet metal guard around insulation to extend up from floor 60 inches. Guard to be galvanized sheet steel not less than 26-gauge.

2.6 FIRE SAFING

A. Metal piping and sleeves passing through floors, roof, partitions and fire walls, shall be provided with firestop by packing space between pipe and sleeve with UL listed non-sag and self-leveling fire safing insulation per manufacturer's instructions.

B. Plastic piping passing through fire rated floors and fire rated walls shall be provided with firestop by providing intumescent wrap strip around the pipe, enclosed in steel collar attached to structure.

C. Cracks, Voids, or Holes Up to 4" Diameter: Use non-sag or self-leveling putty or caulking, one-piece intumescent elastomer, non-corrosive to metal, compatible with synthetic cable jackets, and capable of expanding 10 times when exposed to flame or heat, UL listed.

D. Openings 4" or Greater: Use sealing system capable of passing 3-hour fire test in accordance with ASTM E814, consisting of wall wrap or liner, partitions, and end caps capable of expanding when exposed to temperatures of 250 to 350°F (121 to 177 °C), UL listed.

E. Seal all holes or voids made by penetrations to ensure an effective barrier against smoke, fire, toxic and combustible gases.

F. Unless protected, from possible loading or traffic, install firestopping materials in floors having void openings or four (4) inches or more to support the same floor load requirements.

G. Manufacturer: Subject to compliance with requirements, provide non-sag and self-leveling fire barrier caulk, wrap/strip, moldable putty and sheet forms of one of the following:

1. 3M Brand.
2. Flame Stop.
3. Dow Corning.
4. Metacaulk.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install underground building drains as shown and in accordance with the International Plumbing Code. Lay underground building drains beginning at low point of systems, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install required gaskets in accordance with manufacturer's recommendations for use of lubricants, cements, and other special installation requirements. Clean interior of piping of dirt and other superfluous material as work progresses. Maintain swab or drag in line and pull past each joint as it is completed. Place plugs in ends of uncompleted piping at end of day or whenever work stops.

B. Follow indicated lines generally, but make exact layout on the job to work actual fitting dimensions, align piping, and avoid interference. Provide proper support to maintain uniform fall of 1/4 in. per ft. for lines 3 in. and smaller and 1/8 in. per ft. for lines larger than 3 inches. Protect openings against the entrance of dirt.

C. No soil or waste pipe shall be covered by earth or concealed by construction without first being proven free of leaks by means of a hydrostatic water test of no less than 10-feet of head or pneumatic air test of no less than 5 PSI. Pressure shall be held constant for a period of not less than 15 minutes before beginning inspection or 15 minutes without the addition of air. Plastic pipe shall not be tested by air.

D. Install vents in practical alignment and supported with constant pitch back to the drainage system, concealed from finished spaces, unless shown or directed otherwise.

E. Soil, waste and vent connections to fixtures shall be accurately located and concealed from finished spaces, unless shown otherwise.

F. Refer to Division 31 - Earthwork for excavating, trenching, and backfilling requirements.

G. Contractor shall verify existing tie-in invert elevations of sanitary sewer piping prior to installation of new piping. Coordinate the site sewer tie-in invert elevation with the site utility contractor. Existing tie-in inverts that are discovered to be different from the information on the bid documents shall be reported to the General Contractor and the Engineer immediately.

H. Install no-hub couplings and uniformly tighten clamps to manufacture's recommended torque specifications. No-hub coupling joints shall be properly supported so as to not be exposed to bending.

3.2 SLEEVES

A. Install sleeves for piping passing through floors, roof, walls, concrete beams, and foundations.

B. Install fire-proofing per manufacturer's written instructions.

3.3 ESCUTCHEONS

A. Install escutcheons for pipes entering finished spaces.

3.4 PIPE PENETRATIONS

A. Penetrations shall be free of debris and dirt. Dam the penetration (when required) with an acceptable material. Apply fire stop material to the penetration per manufacturer's installation instructions. Use a caulking gun, putty knife or other normal trade tools. Remove damming materials where necessary after cure. Clean up with Xylene.

3.5 FIRE SAFING

A. Install fire safing at all penetrations through walls, floors, etc. per manufacturer's installation instructions as required to meet UL listing.

3.6 TESTING AND CLEANING

A. Provide labor, materials, facilities, and administration required to conduct the tests required under this section. Tests which fail to meet the specified performance shall be retested at no expense to the Owner. Repair all defective installations.

B. Flush out piping system with clean water before proceeding with required tests. Inspect each run of each system for completion of joints, supports and accessory items.

C. Testing shall be done in compliance with the International Plumbing Code and to the satisfaction of the Authorities Having Jurisdiction.

D. Perform final testing after all fixtures have been set and all traps have been filled with water.

E. Hydraulic Water Testing:

1. Hydraulically pressure test each section or segment of the soil, waste and vent system prior to backfilling, encasing, enclosing or otherwise preventing visual observation of the section or segment being tested or access to repair if needed.

2. The system and all joints shall be tested with no less than 10 feet head of water pressure. Top of test standpipe to be filled with water shall be a minimum of 10 feet above the highest point of section being tested.

3. The water shall be kept in the tested system or sub-section for not less than 15 minutes before inspection for leakage begins.

4. All leaks shall be promptly repaired by replacing damaged or defective components with new parts and system shall be re-tested, repeating repair and re-testing steps as-needed, without additional cost to the Owner, until system is certified tight and leak free.

F. Pneumatic Air Pressure Testing:

1. Plastic piping shall not be tested with air. Do not overpressurize the system beyond maximum rating.

2. Pneumatically pressure test with air each section or segment of the soil, waste and vent system prior to backfilling, encasing, enclosing or otherwise preventing visual observation of the section or segment being tested or access to repair if needed.

3. The system and all joints shall be tested using an air compressor and pressure gauge or manometer testing apparatus.

4. Fill tested system with air to a uniform, stabilized gauge pressure of 5 PSI. The system shall be held at the test pressure without the addition of air for a period of not less than 15 minutes.
5. All leaks shall be promptly repaired by replacing damaged or defective components with new parts and system shall be re-tested, repeating repair and re-testing steps as-needed, without additional cost to the Owner, until system is certified tight and leak free.

END OF SECTION

SECTION 22 1319
SANITARY WASTE PIPING SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Provide equipment, materials, labor and supervision necessary to install soil, waste and vent system.

1.2 CODES AND STANDARDS

A. Local and/or State Plumbing, Mechanical and Building Codes

B. International Mechanical Code

C. NFPA Codes and Standards

1.3 SUMMARY

A. This Section includes the following sanitary drainage piping specialties:

1. Floor drains.
2. Cleanouts.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated, include rated capacities, operating characteristics, and accessories.

B. Installation, Operations and Maintenance data. Include signed copies of certified testing results reports.

1.5 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary piping specialty components.

PART 2 PRODUCTS

2.1 CLEANOUTS

A. Manufacturers: Subject to compliance with requirements, provide clean outs by one of the following:

1. Zurn Plumbing Products Group
2. J.R. Smith
3. Wade
4. Watts Drainage Products Inc.
5. Engineer approved equivalent

2.2 FLOOR DRAINS

A. Sizes: Refer to Project Drawings and Schedules.

B. Traps and Seals:

1. Drains without integral traps shall have service weight cast iron P traps.
2. Provide trap primers on all floor drains and on other drains as shown on Drawings.

C. Manufacturers: Subject to compliance with requirements, provide clean outs by one of the following:

1. Zurn Plumbing Products Group
2. J.R. Smith
3. Wade
4. Watts Drainage Products Inc.
5. Engineer approved equivalent

PART 3 EXECUTION

3.1 INSTALLATION

A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.

B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet (30 m) for larger piping.
4. Locate at base of each vertical soil and waste stack.

C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

D. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.
2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:
   a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
3. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.
4. Provide trap primers on all floor drains and on other drains as shown on Drawings.

3.2 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

3.3 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.4 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

SECTION 22 3100
DOMESTIC WATER SOFTENERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Provide equipment, materials, labor, and supervision necessary to install a complete domestic water softening system as required by the Project Drawings and this Specification.

1.2 CODE AND STANDARDS

A. Softener tank shall be constructed in accordance with NSF/ANSI Standard 44.

B. Softener tank shall be constructed and stamped in accordance with Section VII of ASME code for unlined pressure vessels for a working pressure of 100 PSIG

C. Testing Standards:

1. ASTM D 859, "Standard Test Method for Silica in Water."
2. ASTM D 1067, "Standard Test Methods for Acidity or Alkalinity of Water."
3. ASTM D 1068, "Standard Test Methods for Iron in Water."
4. ASTM D 1126, "Standard Test Methods for Hardness in Water."
5. ASTM D 1129, "Standard Terminology Relating to Water."
6. ASTM D 3370, "Standard Practices for Sampling Water from Closed Conduits."

1.3 QUALIFICATIONS

A. Manufacturer: A firm with at least 5 years of successful manufacturing of domestic water softening equipment.

B. Installer: A firm with at least 5 years of successful installation experience on projects with domestic water softening equipment.

C. Provide water softening equipment manufactured by Culligan, Marlo, Kenitico, or Engineer approved equivalent.

1.4 SUMMARY

A. Provide as indicated a vertical pressure type water softener system complete with pressure vessels, brine tanks, softening resin, control valve, brine maker, and electronic controller.

B. Refer to Water Softener Equipment Schedules which are located on the Project Drawings for system capacity information.

1.5 SUBMITTALS

A. Submit initial facility water quality test report results.

B. Submit product performance and installation data.

C. Submit operational and effluent testing results reports.

D. Submit Installation, Operations and Maintenance manuals.

PART 2 PRODUCTS

2.1 EQUIPMENT

A. Polypropylene Softener Tanks:

1. Tanks shall be polypropylene with fiberglass wrapping.
2. Shall have 50% or more freeboard, 100 psi working pressure and 150 psi test pressure.

B. Brining System:

1. Tank shall be constructed of rigid polyethylene.
2. Brining systems shall be be equipped with a float-operated plastic fitted brine valve and must allow for adjustment of the salt dosage without removing any parts.
3. Capacity shall be sufficient for at least regenerations at full salting and a saturated brine compartment.

C. Valves:

1. Main Operating Valve on each softener shall be automatic multi-port diaphragm type slow opening and closing and free of water hammer. The pressure-actuated valve shall move from one position to another without friction. There will be no contact between dissimilar metals within the valve. Parts subject to wear will be replaceable using common tools. The main control valve must be manufactured by the manufacturer of the softening equipment. Valve shall be equipped with an automatic self-adjusting brine injector to draw brine and rinse at a constant rate regardless of water pressure in the range 30 to 100 psi. Single units shall have an internal automatic bypass of untreated water during regeneration. Valve shall have a soft water sampling cock.
2. A Position Indicator will visually indicate the position of the valve at all times.

D. Pressure Gauges - Each softener shall be provided with two pressure gauges connected to hard water inlet and soft water outlet.

E. Sampling cocks shall be furnished for hard water inlet and soft water outlet in each softener tank.

2.2 CONTROLS

A. Shall have adjustable duration of the various steps in regeneration, shall allow for push-button start and also provide complete manual operation. Regeneration shall be initiated by an electric time switch providing fully automatic operation and adjustable to initiate regeneration at any hour of the day or days of the week.

B. Single Automatic Reset Meter and Altwinator for Twin Softeners Only - The twin water softener shall be equipped with a single water meter in the common outlet header. At a preset gallonage the automatic reset head of the meter will send a 120 V signal to an altwinator that will direct the signal to regenerate the unit presently on stream. Upon completion of regeneration, that softener tank will remain off stream in the stand-by position. This sequence to repeat on an alternating basis each time the preset gallonage of soft water has passed through the meter.

C. Flow Controls for backwash and flush shall be fully automatic requiring no field adjustment.

2.3 WATER TESTING SET

A. Water Testing Set shall be furnished for hardness test, complete with stainless steel container for wall mounting.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install water softening equipment where shown in accordance with equipment manufacturer's written instructions and with industry practices.

B. Provide air gap style piping termination for system discharge at adjacent floor drain.

C. Provide 4" concrete housekeeping pads for floor located tanks, unless noted otherwise.

D. Coordinate system electrical requirements with other trades.

3.2 IDENTIFICATION

A. Identify system components. Comply with requirements for identification in accordance with Section 22 0553 "Identification for Plumbing Piping and Equipment."

3.3 FIELD QUALITY CONTROL

A. Start-Up Service:

1. Fill all brine tanks with water and processed plain salt pellets in accordance with Manufacturer's recommendations.
2. Systems shall be tested and placed in proper working order by Factory Authorized Service Representative(s) or Technician(s) prior to substantial completion and before demonstration of systems to the Owner.

B. Tests and Inspections:

1. Initial facility water quality testing:
    a. Provide a full water quality analysis and report. Results of said report shall be used by manufacturer to determine final water softening equipment selections.
2. Leak test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Tests:
    a. After electrical circuitry has been energized, start units and confirm proper unit operation.
    b. Test and adjust controls and safeties.
        1) Replace damaged or malfunctioning controls and equipment.
        2) Water softeners will be considered defective if they do not pass tests and inspections.
        3) Prepare and submit operational test and inspection reports.
4. Water Softener Effluent Tests
    a. Sample water softener effluent after start up and at three consecutive seven-day intervals (total of four samples) prepare and submit certified test reports for required water performance characteristics.
    b. Comply with the following ASTM Testing Standards:
        1) ASTM D 859, "Standard Test Method for Silica in Water."
        2) ASTM D 1067, "Standard Test Methods for Acidity or Alkalinity of Water."
        3) ASTM D 1068, "Standard Test Methods for Iron in Water."
        4) ASTM D 1126, "Standard Test method for Hardness in Water."

5) ASTM D 1129, "Standard Terminology Relating to Water."
6) ASTM D 3370, "Standard Practices for Sampling Water from Closed Conduits."

5. Demonstrations:

a. Prior to acceptance of the plumbing installation, Factory Authorized Service Representative(s) or Technician(s) shall demonstrate to the Owner or his designated representatives, essential features and functions of all systems installed, and instruct the Owner in the proper operation and maintenance of such systems.

C. A complete set of operating instructions covering the installation, care and operation of the softener system and warranty documentation shall be furnished bound in booklet form.

D. Warranty:

1. The Manufacturer shall guarantee in writing that any mechanical equipment proving defective in workmanship or materials within one year after installation or initial start up shall be replaced at no additional cost.

END OF SECTION

SECTION 22 3300
ELECTRIC DOMESTIC WATER HEATERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Provide materials, equipment, tools, labor and supervision necessary to install Electric Domestic Water Heaters as required by the Drawings and this Section.

1.2 CODES AND STANDARDS

A. ASHRAE/ANSI/IES 90.1 - Energy Efficiency for Buildings Except Low-Rise Residential Buildings

B. IEEC - International Energy Conservation Code

C. ASME Boiler and Pressure Vessel Code

D. NFPA/NEC 70 - National Electrical Code

E. IPC - International Plumbing Code

F. Local and/or State Plumbing, Mechanical and Building Codes

G. NFPA Codes and Standards

H. IAPMO, NSF and U.L. 174 or 1453 Listed

I. Federal Energy Conservation Standards (2015)

J. Any product used for dispensing potable water shall meet NSF 61 and NSF 372 testing standards. Third party testing shall be required.

1.3 SUBMITTALS

A. Product Data: Submit product, dimensional, efficiency and performance data.

B. Wiring Diagrams: Submit manufacturer's electrical requirements for power supply wiring to water heaters. Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed.

C. Installation, Operations and Maintenance data. Include wiring diagrams.

PART 2 PRODUCTS

2.1 ELECTRIC DOMESTIC STORAGE TANK WATER HEATERS

A. Furnish with brass drain valve, thermometer and pressure gauges, and ASME rated T&P relief valve in accordance with State and local codes, regulations and ordinances.

B. Drain Pan: Furnish corrosion resistant material, water tight drain pan with 3/4 inch min. sized drain piping beneath water heaters.

C. Warranty: 6-year tank and parts warranty.

D. Water heater performance shall be as schedule on Drawings. Refer Schedules for energy efficiency factors, first hour ratings, recovery ratings, and storage capacity information.

E. Acceptable Manufacturers: Subject to compliance with requirements, provide equipment by one of the following:

1. A.O Smith
2. State
3. Rudd
4. Engineer approved equivalent

2.2 ELECTRIC DOMESTIC TANKLESS, POINT-OF-USE WATER HEATERS

A. General:

1. U.L. 499 and NFPA/NEC 70 compliant, electric, storage free, tankless domestic water heating equipment. 150 psig working pressure rating. [CHOICE TEXT]
2. Water heater performance shall be as scheduled on Drawings. Refer Schedules for energy efficiency factors, first hour ratings, recovery rating information.
3. Finned copper piping or tubing heat exchanger construction.

B. Warranties:

1. 1 year mechanical or electrical parts, materials and workmanship warranty.
2. 1 year electrical heating element.
3. 5 year warranty due to leakage due to defects in parts, materials or manufacturer's workmanship.

C. Acceptable Manufacturers: Subject to compliance with requirements, provide equipment by one of the following:

1. Eemax, Inc.
2. Stiebel Eltron, Inc.
3. Chronomite Laboratories, Inc.
4. Bosch Water Heating
5. Engineer approved equivalent

2.3 EXPANSION - TANKS

A. Description: Steel, 150 psig max. pressure and 200 degree F max. temperature rated tank constructed with welded joints and factory installed butyl rubber diaphragm and rigid, mechanically bonded polypropylene liner. Include 20 psig air factory pre-charge.

B. Construction:

1. Tappings: Factory fabricated stainless steel, welded to tank before testing and labeling. Include ASME B1.20.1 pipe threads.
2. Interior Finish: NSF 61 compliant barrier materials for potable water systems including fittings and outlets. All wetted components shall be of FDA approved materials.
3. Air Charging Valve: Factory installed, Schrader valve for field charging.

C. Capacity:

1. Tank Capacity: 2 gallons minimum.
2. Acceptance Volume: 0.9 gallons at 20 psig air side pressure.
3. Air Pre-charge Pressure: 20 psi. Field adjust to system operating pressure.

PART 3 EXECUTION

3.1 INSTALLATION

A. Make hot and cold water piping connections including thermal checks.

B. Route T & P relief valve piping to within 6 inches of floor.

END OF SECTION

SECTION 23 0500
COMMON WORK RESULTS FOR HVAC

PART 1 GENERAL

1.1 SECTION INCLUDES

A. The work shall include the furnishings of systems, equipment and materials specified in this Division and as called for on the Mechanical Drawings to include supervision, quality control, operation, methods and labor for the fabrication, installation, start-up and tests for the complete mechanical installation. The work shall also include the furnishing of necessary hoisting facilities to set materials and equipment in place and the furnishing of any scaffolding and transportation associated with this work.

B. Examine the project site and become familiar with existing conditions which will affect the work. Review the drawings and specifications of other trades and take note of conditions to be created which will affect the work. All conditions shall be considered in the preparation of bids; no additional compensation will be made on the behalf of this Contractor.

C. Provide labor necessary to demolish the existing mechanical system as shown on the drawings, as described in Part 3, Existing Conditions, or as required.

D. Where noted on the drawings or where called for in other sections of the specification, the Contractor for this division shall install equipment furnished by others, and shall make required service connections. Verify with the supplier of the equipment the requirements for the installation. This contractor shall be responsible for the removal and installation of railings, piping, ductwork, louvers, etc. as required to install new equipment. Coordinate shipping splits for all equipment provided by this contractor.

1.2 DAMAGE

A. The Contractor shall be responsible for damage to the work of other trades or to the building and its contents, caused by equipment installation.

1.3 PERMITS AND INSPECTIONS

A. Obtain and furnish necessary permits and inspection certificates for material and labor furnished. Permits and certificates shall be obtained from the proper inspection authorities. The cost of permits, certificates and fees required in connection with the installation shall be borne by the Contractor, unless otherwise noted in the detailed contractual description preceding these specifications. Where applications are required for the procuring of utility services to the building, see that such application is properly filed with the utility, and that information required for such an application is presented to the extent and in the form required by the utility company.

1.4 CODES AND STANDARDS

A. Applicable provisions of the following codes and standards are hereby imposed on a general basis for the mechanical work (in addition to specific applications specified by individual work sections of these specifications):

B. If any work indicated on the drawings or specified herein conflicts in any way with any of the rules and regulations of the above authorities, the Contractor shall notify the Architect/Engineer in writing 72 hours before bids are opened. In the event the Contractor fails to notify the Architect/Engineer and changes are required by said conflicts, the Contractor shall make such changes as are required without additional cost to this Owner.

C. Installations must be safe in every respect, and must not create a condition which will be harmful to building occupants; to operating, installing or testing personnel; to workmen; or to the public. The contractor for each installation shall be solely responsible for providing installations which will meet these conditions. If the Contractor believes that the installation will not be safe for all parties, report these beliefs in writing to the Architect/Engineer before any equipment is purchased or work is installed, giving recommendations. The Architect/Engineer will work out required changes and adjustments in contract price where adjustments are warranted.

1.5 DRAWINGS

A. A complete set of drawings including civil, architectural, structural, mechanical, and electrical drawings shall be on the site at all times. Prior to installing any of the work, check the drawings for dimensions and see that the work does not interfere with clearance required for ceilings, beams, foundations, finished columns, pilasters, partitions and electrical equipment as shown on the drawings and details. After work is installed and it develops that interferences occur which have not been called to the Architect/Engineer's attention before the installation, the Contractor shall, at his own expense, make such changes in his work as directed by the Architect/Engineer.

B. The contract drawings for mechanical work are in part diagrammatic, intended to convey the scope of work and indicate general arrangement and approximate sizes and locations of equipment and materials. Where job conditions require reasonable changes in indicated locations and arrangement, the Contractor shall make such changes as directed by the Architect/Engineer, without additional cost to the Owner.

C. Because of the scale of the drawings, certain basic items such as pipe fittings, access panels, and sleeves may not be shown; but where such items are required by other sections of these specifications or where they are required by the nature of the work, they shall be furnished and installed. Rough-in dimensions and locations shall be verified with the supplier of equipment furnished by other trades, or by the Owner, prior to the time of roughing-in.

D. Equipment specification may not deal individually with minute items required such as components, parts, controls and devices which may be required to produce the equipment performance specified, or as required to meet the equipment warranties. Where such items are required, they shall be included by the supplier of the equipment, whether or not specifically called for.

E. The drawings and the specifications are cooperative and supplementary. It is the intent of both said drawings and specifications to cover all mechanical requirements in their entirety as nearly as possible. The Contractor shall closely check the drawings and specifications for any obvious errors or omissions and bring any such condition to the attention of the Architect/Engineer prior to the receipt of bids, in order to permit clarification by means of a mailed Addendum. If there is no question prior to the bid proposal date, the Architect/Engineer shall assume that the drawings and specifications are complete and correct and will expect the intent of said documents to be complied with, and the installation to be complete in all respects, according to said intent.

F. Locate equipment which must be serviced, operated or maintained in fully accessible positions. Minor deviations from the contract drawings may be made to allow for better accessibility, but changes of magnitude, or which involve extra cost, shall not be made without prior approval. Ample space shall be allowed for removal of parts that may require replacement or service in the future.

G. All valves, fire dampers, automatic dampers, smoke dampers, damper operators, reheat coils, etc. shall be accessible for maintenance purposes. Locate items carefully and coordinate with other trades so that each piece of equipment is accessible and functional. Items located above a non-accessible ceiling, chase, or soffit shall be accessible through an access door. Coordinate location of access doors with the general contractor.

1.6 RESPONSIBILITY

A. The Contractor's responsibility shall not end with the installation and connecting of the various apparatus. It shall include the services of an experienced superintendent, who shall be constantly in charge of the work, together with the qualified journeymen, helpers and laborers required to properly unload, install, connect, adjust, start, operate and test the work involved, including equipment and materials furnished by other trades or by the Owner, until such time as the entire mechanical installation functions properly in every detail.

1.7 COORDINATION

A. Coordinate the work with other trades prior to installation.

B. No piping, ducts or equipment foreign to the electrical equipment or architectural appurtenances shall be run over the top of any electrical panels or electrical equipment, in accordance with NEC 110-16 and 384-4. This does not prohibit sprinkler protection for the installation.

C. The determination of quantities of material and equipment required shall be made from the drawings. Schedules on the drawings and in the specifications are completed as an aid, but where discrepancies arise, it shall be the Contractor's responsibility to provide the required quantity.

D. Where the specifications state that equipment shall be furnished, installed or provided, it shall be understood to mean this Contractor shall furnish and install completely, unless it is specifically stated that the equipment is to be furnished and installed by others.

E. The Architect/Engineer reserves the right to determine space priority of the contractors in the event of interference between the piping and equipment of the various contractors. Conflicts between the drawings and specifications, or between requirements set forth for the various trades, shall be called to the attention of the Architect/Engineer. If clarification is not asked for prior to the taking of bids, it will be assumed that none is required, and that the Contractor has submitted his bid in conformance with plans and specifications as issued and that no interference exists.

F. No piping, ducts or equipment foreign to an elevator hoistway and machine room shall be run inside the hoistway and machine room in accordance with NEC 620-37 and ASME A17.1, 102.2.

1.8 GUARANTEE AND MAINTENANCE

A. Materials and equipment shall be guaranteed to be free from defects and to be new equipment; no secondhand, used or salvaged equipment will be allowed.

B. Keep the entire portion of the work in repair, without additional cost to the Owner, so far as defects in workmanship, apparatus, material or construction are concerned for one (1) year from the date of final acceptance, except as otherwise specified herein.

C. Equipment, which fails to meet performance ratings as specified and shown on the drawings, shall be removed and replaced by new equipment that meets the specified requirements, without additional cost to the Owner.

D. Materials and workmanship shall be subject to the review of the Architect/Engineer, in whose presence various tests shall be made as required by these specifications.

PART 2 PRODUCTS

2.1 SUBMITTAL PROCESS

A. Submit shop drawings and catalog data for mechanical equipment specified in Division 23 in accordance with Division 01.

B. Submittal data for mechanical equipment shall consist of shop drawings and/or catalog cuts showing technical data necessary to evaluate the material or equipment to include dimensions, wiring diagrams, performance curves, rating, control sequence, and other descriptive data necessary to describe fully the item proposed and its operating characteristics. Shop drawings shall be submitted on equipment and materials as required by the specifications.

C. Approval of materials, including alternate or substitute items, shall be obtained in writing from the Architect/Engineer, verbal approval will not be considered binding.

D. Shop drawings shall be submitted and shall have been signed, checked, approved, and initialed by the Contractor prior to submittal to the Architect/Engineer. The Architect/Engineer will review shop drawings to aid in interpreting the plans and specifications, and will in so doing assume that the shop drawings conform to specified requirements set forth in this specification. The approval of the shop drawing by the Architect/Engineer does not relieve the Contractor of the responsibility of complying with elements of the specification. The name of the job, Architect/Engineer, location, and specification section shall appear on all pages of shop drawings. Equipment marks (such as EF-1, RTU-1) shall be indicated for each item.

E. At the completion of the job, furnish three (3) copies of parts lists, operating and maintenance instructions, and manuals organized and bound, in three books.

F. At the completion of the project, prepare and submit to the Owner record drawings showing the location of piping and ductwork. Drawing shall give accurate dimensions of such equipment for future use by the Owner. This drawing shall be submitted as soon as work is completed and before authorization of final payment.

2.2 SUBCONTRACTORS AND MATERIALS

A. Submit to the Architect/Engineer for review, when requested, a list of subcontractors, materials and equipment proposed to be used. The list must be reviewed by the Architect/Engineer before this Contractor may enter into any subcontractual agreement. Equipment, materials, and devices, etc. shall be subject to the review of the Architect/Engineer, whether or not said items are herein specified.

2.3 STANDARDS OF MATERIALS AND WORKMANSHIP

A. Materials shall be new, complete with manufacturer's guarantee or warranty, and shall be as listed by Underwriters Laboratories (UL), Inc., Air Movement and Control Association (AMCA), American Gas Association (AGA), Air Conditioning and Refrigeration Institute (ARI), etc., if a standard has been established by that agency for the type of material.

B. Materials shall also comply with applicable standards of the National Electrical Manufacturer's Association, National Board of Fire Underwriters, National Fire Protection Association, National Safety Council, National Bureau of Standards, the National Electrical Code and the Williams-Steiger Occupational Safety and Health Act of 1970. Such standards are hereby made a part of these specifications.

C. Work shall be performed by workmen skilled in the particular craft, shall be executed in a workmanlike manner, and shall present a neat mechanical appearance when completed. Align, level and adjust equipment for satisfactory operation, and install so that connecting and disconnecting of piping and accessories can be made readily and so that parts are easily accessible for inspection, operation and maintenance. Methods and techniques of installation shall be subject to the review of the Architect/Engineer.

D. Materials shall be the standard product of a reputable manufacturer regularly engaged in the manufacture of the specific product. Materials of the same type of class shall be the products of one manufacturer. For example, fans shall be from the same manufacturer and pumps from the same manufacturer.

E. Materials shall be protected from damage, and stored indoors or protected from the weather at all times, unless other storage arrangements are approved by the Architect/Engineer.

F. Bearing lubrication fittings shall be as recommended by the manufacturer and shall be extended, where necessary, to an accessible location.

G. Material and equipment shall be installed in strict accordance with the manufacturer's recommendations.

2.4 MATERIAL SUBSTITUTIONS

A. Proposals as submitted shall be based on the products specifically named in the specification or on the drawings. Material or equipment by manufacturers other than those specified may be used only by permission of the Architect/Engineer. Such permission for substitution must be requested, in writing in accordance with Division 01.

B. The Architect/Engineer reserves the sole right for the approval of proposed material or equipment, and the phrase, "or approved equivalent", used in these specifications, or on the drawings, shall be interpreted to mean an equivalent approved by the Architect/Engineer.

C. Changes required by alternate equipment shall be made at no additional cost to the Owner; and costs incurred by other trades, public utilities or the Owner, as a result of the use of such equipment, shall be the responsibility of the Contractor.

D. Furnish to the Architect/Engineer, when requested, samples of proposed material or equipment substitutions. These samples shall remain with the Architect/Engineer as long as needed.

E. Identify the differences in alternate material or equipment as compared to that specified, and indicate the benefits to the project as a result of selecting the alternative.

F. The Architect/Engineer reserves the right to refuse approval of equipment which does not meet the specification, in their opinion, or of equipment for which no local experience of satisfactory service is available. The Architect/Engineer further reserves the right to reject equipment for which maintenance service and the availability of replacement parts is questionable.

PART 3 EXECUTION

3.1 EXISTING CONDITIONS

A. Examine the existing buildings and grounds and become familiar with the conditions as they exist, or that will in any manner affect the work under this contract. No allowance will be made subsequently, in this connection, on behalf of the Contractor for any error or negligence by the Contractor.

B. Existing equipment, such as duct or pipe, in or on the existing building and grounds which is to be replaced, or which interferes in any way with the remodeling of the existing facilities and/or installation of new equipment, shall be removed from the premises or relocated by this Contractor, as directed by the Architect/Engineer. Do not remove from the premises, any equipment that may have maintenance value to the Owner without permission of the Owner. Equipment, duct or pipe not to be reused shall be removed from the premises, unless otherwise noted herein or shown on the drawings.

C. Where existing equipment is removed or changed, all duct and pipe no longer in service shall be removed and stubs plugged as directed by the Architect/Engineer. Building surfaces damaged and openings left by removal of equipment shall be repaired by the proper trades and paid for by this Contractor, unless otherwise noted on the drawings. The cutting and fitting shall be done by this Contractor. The cutting of floor, ceiling or wall surfaces shall be done by this Contractor with extreme care, in order to avoid any disrupting or damage of existing utility services which may be encountered. Coordinate with other trades and with the General Contractor to minimize the damage to the building in order to reduce the amount of patching required.

D. Where new openings are cut and concealed piping is encountered, such items shall be removed or relocated as required. Where systems to be removed stub through floors, walls or ceilings, openings shall be patched so that no evidence of the former installation remains.

E. Existing active services (water, gas, sewer, electric), when encountered, shall be protected against damage. Do not prevent or disturb operation of active services that are to remain. If active services are encountered which require relocation, make request to authorities with jurisdiction for determination of procedures. Where existing services are to be abandoned, they shall be terminated in conformance with requirements of the utility or municipality having jurisdiction.

F. The location, size and elevation of underground utilities shown on the drawings are in accordance with data supplied by the Owner and/or the various utility companies. The Contractor shall verify this data and shall report any discrepancies to the Architect/Engineer before submitting his bid.

3.2 INTERRUPTION OF SERVICE

A. Changes in service shall be made so as to provide a minimum of interference with the operation of services in the building. When changes require shutdown of building services, notify the proper building authorities no less than 24 hours in advance and obtain approval from these authorities before making changes. Such notices shall give duration and nature of shutdown. Temporary arrangements shall be approved by the Architect/Engineer and/or Owner.

B. Any and all interruptions to building services shall be in accordance with Division 01.

3.3 OPENINGS, CUTTING, AND PATCHING

A. The General Contractor shall coordinate the placing of openings in the new structure, as required for the installation of the mechanical work.

B. Furnish to the General Contractor the accurate locations and sizes for required openings. This shall not relieve this Contractor of the responsibility of checking to assure that proper size openings are provided. When additional patching is required due to this Contractor's failure to inspect this work, this Contractor shall make arrangements for the patching required to properly close the opening, to include patch painting. This Contractor shall pay any additional cost incurred in this respect.

C. When cutting and patching of the structure is made necessary due to this Contractor's failure to install piping, ducts, sleeves or equipment on schedule, or due to this Contractor's failure to furnish, on schedule, the information required for the leaving of openings, it shall be this Contractor's responsibility to make arrangements for this cutting and patching. This Contractor shall pay any additional cost incurred in this respect.

D. Provide cutting and patching and patch painting in the existing structure, as required for the installation of the work. Furnish lintels and supports as required for openings. Cutting of structural support members will not be permitted without prior approval of the Architect/Engineer. Extent of cutting shall be minimized. Use core drills, power saws or other machines which will provide neat, minimum openings. Patching shall match adjacent materials and surfaces and shall be performed by craftsmen skilled in the respective craft required.

3.4 CONCRETE AND MASONRY WORK

A. Concrete work included herein or shown on the drawings shall be done only by experienced cement finishers. Brickwork, where included, shall be laid only by experienced brick masons. Brick shall be of uniform size, hard burned, and shall be laid in cement mortar, except for patch work at a location where cement and lime mortar has previously been used. Exposed, finish brickwork shall match existing brickwork as closely as practical and shall be to the satisfaction of the Architect/Engineer and Owner.

B. Concrete bases and pads for mechanical equipment will be furnished by General Contractor. This Contractor shall coordinate size and location.

C. Furnish equipment anchor bolts and be responsible for their proper installation and accurate location.

3.5 ROOF OPENINGS

A. Roof openings required by this Contractor that are not shown on the Structural or Architectural Drawings shall be cut and (if necessary) reinforced by an experienced roofing contractor.

B. Roof penetrations for duct and piping shall be through curbed roof openings. Equipment supports shall be by curbed and flashed runners meeting current National Roofing Contractor Association (NRCA) standards and details. Pitch pockets, pitch pans, and wood blocking are not acceptable.

C. All roof work shall be completed such that it does not void any existing roof warranty.

3.6 PAINTING

A. The finish of any item that has been marred, scratched or damaged in any way by this Contractor shall be repainted at the expense of this Contractor, and to the satisfaction of the Architect/Engineer and the Owner.

B. Painting and finishing of exposed mechanical systems including piping and duct shall be as shown on the drawings and in DIVISION 09 - FINISHES.

3.7 CLEANING

A. Keep the premises clean of all debris, caused by the work as described in DIVISION 01.

B. At the conclusion of the construction, the site shall be thoroughly cleaned of all rubble, debris and unused material and shall be left in good order. Closed off spaces shall be cleaned of waste such as material, cartons, and wood frame members used in the construction.

3.8 SUSPENSION FROM WOOD STRUCTURAL MEMBERS

A. In general, concentrated or other loads shall not be suspended directly from the bottom of wood structural members, unless approved by the Architect/Engineer. Loads suspended from open web joists or trusses may be transferred to the bottom chord of the structural member at the panel points. Loads suspended from solid web joists shall be transferred to the joists only through the top flange or web. Suspension systems shall be reviewed by the Architect/Engineer.

3.9 WIRING FOR MECHANICAL EQUIPMENT

A. The electrical contractor will provide power to and connection of motors and equipment furnished by this Contractor. Where disconnect switches are not specified to be furnished with the equipment, the electrical Contractor will furnish disconnect switches for equipment furnished by this Contractor.

B. Provide integral wiring, alarm wiring, control wiring, temperature control wiring and interlock wiring for equipment furnished, whether or not such wiring is furnished by the equipment vendor.

C. Except where other Sections call for starters to be furnished by manufacturers as part of their equipment, the electrical contractor will furnish motor starters for motors furnished by this Contractor.

D. Furnish to the electrical contractor, shop drawings and a schedule for motors and other mechanical equipment furnished, which require electrical services. The schedule shall include the locations for rough-ins, electrical loads, size, and electrical characteristics for services required.

E. Additional costs incurred, where motors or equipment furnished by this Contractor require larger services or services of different electrical characteristics than those called for on the Electrical Drawings, due to the Contractor furnishing substitute equipment, shall be paid for by this Contractor.

F. Review the Electrical Drawings and call to the attention of the Architect/Engineer, prior to bidding, omissions of electrical services required for equipment.

G. Mechanical equipment which requires fuse protection, to maintain UL listing, shall be coordinated with the electrical contractor to provide such protection.

3.10 MOTORS

A. TEFC and ODP motors for equipment supplied by this contractor shall meet or exceed the listed values when tested in accordance with IEEE Standard 112 Method B as defined by NEMA Standard MG 1-12.6C. Efficiency values listed are based on NEMA Premium Efficiency Motors of NEMA MG 1-2003, Table 12-12 at 1800 RPM:

HP	ODP	TEFC
1	85.5	85.5
1.5	86.5	86.5
2	86.5	86.5
3	89.5	89.5
5	89.5	89.5
7.5	91.0	91.7
10	91.7	91.7
15	93.0	92.4
20	93.0	93.0

25	93.6	93.6
30	94.1	93.6
40	94.1	94.1
50	94.5	94.5
60	95.0	95.0
75	95.0	95.4
100	95.4	95.4
125	95.4	95.4
150	95.8	95.0
200	95.8	95.0

B. All motors that are indicated to be used with Variable Frequency Drives (VFDs) shall be inverter duty rated. Coordinate all motor requirements with the electrical contractor.

3.11 PROTECTION

A. Special care shall be taken for the protection of equipment furnished by this Contractor. Equipment and material shall be protected from elements such as weather, painting and plastering until the project is completed. Damage from rust, paint or scratches shall be repaired as required to restore equipment to original condition.

B. Protection of equipment during the plastering and painting of the building shall be the responsibility of the contractor performing that work, but this shall not relieve this Contractor of the responsibility of checking to assure that adequate protection is being provided.

C. Where the installation or connection of equipment requires this Contractor to work in areas previously finished by other contractors, this Contractor shall be responsible that such areas are protected and are not marred, soiled or otherwise damaged during the course of such work. This Contractor shall arrange with the other contractors for repairing and refinishing of such areas which may be damaged.

D. When heavy materials must be placed upon or transported over the roof deck, sheeting shall be placed to distribute the weight and support such materials. Any damage shall be immediately corrected at no cost to the Owner.

3.12 ASBESTOS IDENTIFICATION AND CONTROL

A. In the event that suspected asbestos containing material (ACM) is encountered during the course of the work, cease operations in the immediate area and promptly notify the Architect/Engineer. Suspected materials will then be sampled and analyzed by the Owner. Should ACM be identified, the Owner's Representative will direct the procedures for abatement, either by subcontract to the Contractor or separate contractor. During abatement operations, cease operations in the immediate area of the abatement. Operations in other areas of the project may be performed, but care must be taken to control dust to avoid contamination of the abatement containment or air monitoring samples. The Contractor shall coordinate activities with the asbestos abatement contractor.

B. Should no ACM be identified, operations may be resumed. Delays caused by identification, analysis or abatement may be added to the time of the contract, at the discretion of the Architect/Engineer by Change Order.

3.13 NOISE AND VIBRATION

A. Be responsible for the installation of all equipment in such a manner as to control the transmission of noise and vibration from any installed equipment or system, so that the sound level does not exceed NC35 in any occupied space. Be responsible for the correction of any objectionable noise in any occupied area due to improperly installed equipment.

3.14 TESTS AND DEMONSTRATIONS

A. Systems shall be tested and placed in proper working order prior to demonstrating systems to the Owner.

B. Prior to acceptance of the mechanical installation, demonstrate to the Owner or his designated representatives essential features and functions of all systems installed, and instruct the Owner in the proper operation and maintenance of such systems.

C. Furnish the necessary trained personnel to perform the demonstrations and instructions, and arrange to have the manufacturer's representatives for the system present to assist with the demonstrations. The Owner and Contractor shall each sign a certification stating that the training has been performed and the Owner accepts same.

3.15 UTILITY REBATE APPLICATIONS

A. This contractor shall be responsible for gathering information necessary for completing local utility rebate applications, and submitting to the proper utility companies for gas and electric rebates. Potential rebates include high efficiency gas boilers, thermostats, timeclocks, motors, and other items furnished by this mechanical contractor.

END OF SECTION

SECTION 23 0513
COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 GENERAL

1.1 SUMMARY

A. Section includes general requirements for TEFC and ODP motors for use on ac power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

1.2 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.
5. Motors for operation with variable speed drives shall include motor shaft grounding kits.

PART 2 PRODUCTS

2.1 MOTORS

A. Provide motors for all mechanical equipment furnished under Division 23, as indicated herein and as illustrated on the Contract Drawings.

B. The following equipment with 3-phase, 1 horsepower motors or larger shall be provided with NEMA Premium efficiency motors as specified herein:

1. Fans
2. Air Handling Units
3. Pumps
4. Fan Coil Units
5. Blower Coil Units

C. TEFC and ODP motors for equipment supplied by this contractor shall meet or exceed the listed values when tested in accordance with IEEE Standard 112 Method B as defined by NEMA Standard MG 1-12.6C. Efficiency values listed are based on NEMA Premium Efficiency Motors of NEMA MG 1-2003, Table 12-12 at 1800 RPM:

HP	ODP	TEFC
1	85.5	85.5
1.5	86.5	86.5
2	86.5	86.5
3	89.5	89.5
5	89.5	89.5
7.5	91.0	91.7

10	91.7	91.7
15	93.0	92.4
20	93.0	93.0
25	93.6	93.6
30	94.1	93.6
40	94.1	94.1
50	94.5	94.5
60	95.0	95.0
75	95.0	95.4
100	95.4	95.4
125	95.4	95.4
150	95.8	95.0
200	95.8	95.0

D. All motors that are indicated to be used with Variable Frequency Drives (VFDs) shall be inverter duty rated. Coordinate all motor requirements with the electrical contractor.

E. Certification: Provide manufacturer's literature indicating NEMA premium motor efficiency as tested in accordance with IEEE Standard 112, Test Method B. Provide documentation to verify motors served by variable frequency drives meet NEMA MG1.

PART 3 EXECUTION

3.1 VERIFICATION

A. Verify motor shaft grounding kit is properly installed and adjusted.

B. Verify motor and sheave alignment for all belt driven and direct coupled equipment.

END OF SECTION

SECTION 23 0529
HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Provide equipment, materials, labor and supervision necessary to install pipe hangers and supports.

B. Pipe support systems shall secure pipes in place, prevent pipe vibration, provide vertical adjustment for maintaining required grades, and provide for expansion and contraction.

C. Where supports are attached to concrete or other structural members, care shall be taken to prevent damage or weakening of the structural members.

D. Where concrete inserts are to be used, it shall be this Contractor's responsibility to accurately locate and attach inserts to concrete forms.

1.2 REFERENCES

A. American National Standards Institute, ANSI:

B. ANSI B31.1: Power Piping.

C. Manufacturers Standardization Society of the Valve and Fittings Industry, MSS, 1815 North Fort Myer Drive, Arlington, VA 22209.

1. MSS SP-58: Materials Standardization Society: Pipe Hangers and Supports-Materials, Design, and Manufacturer.
2. MSS SP-69: Materials and Standardization Society: Pipe Hangers and Supports - Selection and Application.
3. NFPA 13-Standard for the Installation of Sprinkler Systems.
4. ASTM A123-Specification for Zinc Hot-Galvanized Coatings by the Hot Dip Process.
5. ASTM A653 G90-Specification for Steel Sheet, Zinc on Iron and Steel.

1.3 SUBMITTALS

A. Submit manufacturer's product data on all hangers and support devices. Product data to include, but not be limited to materials, finishes, approvals, load ratings, and dimensional information.

PART 2 PRODUCTS

2.1 HANGERS AND SUPPORTS

A. Hangers and support devices shall be Anvil International Inc., Tolco, Fee and Mason, Michigan, B-Line or approved equivalent. Figure numbers based on Anvil.

PART 3 EXECUTION

3.1 INSTALLATION - HORIZONTAL PIPE SUPPORTS

A. Hanger rods for steel, wrought iron and brass pipe shall be installed in accordance with MSS SP-69 Tables 3 and 4 and the following schedule:

Pipe Size	Rod Diameter	Maximum Spacing
Up to 1-1/4"	3/8"	7'-0"
1-1/2" and 2"	3/8"	9'-0"
2"	3/8"	10'-0"
2-1/2", 3" and 3-1/2"	1/2"	10'-0"
4" and 5"	5/8"	12'-0"
6"	3/4"	12'-0"
8"	7/8"	14'-0"
10" and 12"	7/8"	16'-0"
14" and 16"	1"	16'-0"
18"	1-1/8"	18'-0"
20" and 24"	1-1/4"	20'-0"
Pipe Size	**Rod Diameter**	**Maximum Spacing**
1/2" and 3/4"	3/8"	5'-0"
1"	3/8"	6'-0"
1-1/4"	3/8"	7'-0"
1-1/2"	3/8"	8'-0"
2"	3/8"	8'-0"
2-1/2"	1/2"	9'-0"
3", 3-1/2" and 4"	1/2"	10'-0"
5"	1/2"	13'-0"
6"	5/8"	14'-0"
8"	3/4"	16'-0"

B. Support horizontal cast iron soil pipe with two hangers for each pipe length. Locate hangers close to couplings.

C. In addition to the above specified spacings, install additional hangers at change in pipe direction and at concentrated loads, large valves and strainers.

D. Where more than one pipe is to be run parallel together, they may be supported on trapeze type hangers. Trapeze bar angles and hanger rods shall be of sufficient size to support the particular group of pipes. Trapeze hanger spacing shall be based on the smallest pipe on the rack. When hanging from light gauge metal trusses, coordinate pipe hanger spacing and hanger rod connection points with the truss manufacturer.

E. For suspending hanger rods from brackets attached to walls, use welded steel brackets; Fig. 194 for loads up to 750 lbs; Fig. 195 for loads up to 1500 lbs; Fig 199 for loads up to 3000 lbs.

F. Where pipes are to be racked along walls, use “Unistrut” pipe racks or 12 gauge steel strut channel, 1-5/8” x 1-5/8” minimum.

1. Mount pipes to strut channel with two-piece pipe straps to match outside diameter of pipe including insulation.

G. Attach all pipe hangers from support rods using double locknuts tightened to prevent loosening.

3.2 INSTALLATION - VERTICAL PIPE SUPPORTS

A. Support vertical steel, wrought iron, copper and brass pipe at every other floor line.

B. Support vertical cast iron soil pipe at every floor line.

C. In addition to the above, support vertical pipes at base of riser with base fitting set on concrete or brick pier, or by hanger located on horizontal connection close to riser.

D. Where pipe sleeves extend above floor, place pipe clamps at ceiling below and support clamp extensions from inserts or other approved attachment.

3.3 PIPE ATTACHMENTS

A. For horizontal steel and wrought iron pipe, use carbon steel adjustable clevis hanger, Fig. 260. For floor support or support directly above steel beams, use pipe roll stand, Fig. 177.

B. For horizontal copper pipe and tube, use copper-plated adjustable swivel ring, Fig. CT-69.

C. When thermal expansion for horizontal pipe is in excess of ½" axially, use adjustable swivel pipe roll, Fig. 181, or pipe roll stand, Fig. 177.

D. For horizontal cast iron soil pipe, use clevis hanger, Fig. 260.

E. For vertical, steel, wrought iron and cast iron pipe, use extension pipe clamps, Fig. 261.

F. For vertical copper pipe and tube, use copper-plated extension pipe clamp, Fig. CT-121.

3.4 INTERMEDIATE ATTACHMENTS

A. Hanger rods: use carbon steel single or double end threaded, Figs. 140, 253 as required. Continuous threaded rod: Fig. 146 may be used wherever possible.

B. Chain wire or perforated strap hangers will not be permitted. One pipe shall not be suspended from another pipe.

3.5 STRUCTURAL ATTACHMENTS

A. For attaching steel or copper plated hanger rods to reinforced concrete, use galvanized malleable iron concrete inserts; Fig. 282 for loads up to 1140 lbs.

B. For attaching steel hanger rods to structural steel beams, use malleable iron C-clamps; Fig. 92, Fig. 93 or Fig. 94 with retaining clip Fig. 89 or Fig. 89X for loads up to 500 lbs; Fig. 218 with extension piece for loads up to 1,365 lbs. For copper plated hanger rods, use copper plated malleable iron C-clamps; Fig. CT-138R for loads up to 180 lbs.

C. For attaching steel hanger rods to wood structural members, use malleable iron ceiling flange; Fig. 153 for loads up to 1,270 lbs. For copper plated hanger rods, use copper plated malleable iron ceiling flange: Fig. CT-128R for loads up to 180 lbs.

D. Vertical expansion shields or toggles shall not be used for suspending hanger rods, except with permission in cases where inserts have been omitted or cannot be used. If permitted, use expansion shields; for rod sizes up to ½", 320 lbs. max. load. For hanger rods larger than ½" use attachment plate, Fig. 52, with wedge anchors.

E. Powder actuated anchoring methods shall not be used.

3.6 PIPE COVERING PROTECTION

A. Hangers and supports for insulated piping shall not injure or pierce insulation. Provide insulation protection shields in conjunction with hanger or roll device. Use Fig. 160 and 165, Protection Saddles.

3.7 SUPPLEMENTAL STEEL

A. Provide supplemental steel required to hang or support mechanical equipment or piping.

END OF SECTION

SECTION 23 0548
VIBRATION AND SEISMIC CONTROLS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. This specification pertains to the furnishing and installation of vibration isolation devices for HVAC piping and rotating or reciprocating mechanical equipment.

B. This work shall include all material and labor required for installation of the resilient mounting and suspension systems, adjusting each mounting system, and measurement of isolator system performance when so requested by the Architect/Engineer. Specific mounting arrangements for each item of mechanical equipment shall be as described herein and as indicated by schedules and details on the drawings.

1.2 QUALIFICATIONS

A. All rotating mechanical equipment shall be isolated from the structure by means of vibration isolators. The isolators and bases shall be as tabulated on the Vibration Isolation Schedule in this section. Any equipment not listed in this schedule shall be isolated with the isolator type and deflection shown in the 2007 ASHRAE HVAC Applications Handbook, Chapter 47, Table 48.

B. Vibration isolators and bases shall be as manufactured by Kinetics Noise Control, Mason Industries, Amber Booth or approved equivalent, and shall all be provided by the mechanical contractor form a single manufacturer to assure single responsibility for the performance of all isolation equipment. The isolator manufacturer's submittal shall include a tabulation of the design data with dimensions for both free and operating heights of the isolators.

C. Engage manufacturer to provide technical supervision of installation of support isolation units produced, and of associated inertia bases.

D. The Contractor and the vibration isolation manufacturer or his regularly designated and factory authorized representative shall perform the following tasks in addition to the supply and installation of isolation equipment:

1. Obtain from the Architect/Engineer the approved manufacturer's name, model number, and other necessary identifying data for each item of mechanical equipment to be resiliently mounted. Coordinate resilient mounting systems with the exact equipment to be furnished in regard to physical size, isolator locations, weight, rotating speed, etc. Direct contact and cooperation between the vibration isolation device fabricator and the equipment manufacturer will be required.

2. Select piping systems isolators for proper coordination with the physical arrangement of pipe lines and with the physical characteristics of the building.

3. Provide on-the-job supervision as required during installation of resiliently mounted equipment and piping to assure that vibration isolators are installed in strict accordance with normally accepted practices for critical environments.

4. Replace, at no extra cost to the Owner, isolators which do not produce the required deflection, are improperly loaded above or below their correct operating height, or which do not produce the required isolation.

5. Cooperate with other contractors engaged in this project so that the installation of vibration isolation devices will proceed in a manner that is in the best interests of the Owner.

6. Notify the Architect/Engineer of project conditions which affect vibration isolation system installation of performance and which are found to be different from conditions indicated by the drawings or described by the specifications. Should vibrations isolation system installation proceed without such notifications, remedial work required to achieve proper isolator performance shall be accomplished by the contractor at no additional cost to the Owner.
7. Be alert for possible short-circuiting of vibration isolation systems by piping supports, electrical connections, temperature control connections, drain lines, building construction, etc., and notify the involved contractor as to these problems or potential problems. Where such situations cannot be easily resolved, notify the Architect/Engineer so that preventive or remedial action can take place on a timely basis. Remedial measures required shall be undertaken by the contractor responsible at no additional cost to the Owner.

E. Vibration isolation products furnished as part of factory-fabricated equipment are specified as part of the equipment assembly in other Division 23 sections.

F. Refer to other sections of these specifications for equipment foundations, hangers, sealants, gaskets and other work related to vibration isolation work.

G. Where equipment manufacturer's recommendations differ from specified vibration isolation, submit to Architect for approval.

H. Furnish templates to fabricators of equipment bases, foundations and other support systems, as needed for coordination of vibration isolation units with other work.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's specifications, detailed drawings, performance characteristic data and installation instructions for each type of unit required. Indicate equipment to be installed with isolator, tabulation of design data with dimensions for both free and operating heights of isolators, and load on each.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic-Restraint Loading:

1. Site Class as Defined in the IBC: A.

PART 2 PRODUCTS

2.1 GENERAL

A. The vibration isolation systems described herein and identified by type number designations shall be applied to specific classifications of mechanical equipment as indicated in the Vibration Isolation Schedule.

2.2 TYPE 1 ISOLATORS (RUBBER & GLASS FIBER PADS AND HANGERS)

A. Pre-compressed Molded Fiberglass Vibration Isolation Pads, individually coated with a flexible moisture impervious elastomeric membrane. Pads shall be fine (.00018 dia.) bonded annealed glass fibers which have been stabilized during manufacture by overloading the material ten times. Pads shall have a constant natural frequency over the operating load range, and the stiffness shall increase proportionately with load applied. Pads shall be no taller than the shortest horizontal dimension. Where the equipment base does not provide a uniform load surface, steel plates shall be bonded to the top of the pads. Alternately, Neoprene Mounts incorporating completely enclosed metal inserts to permit bolting the supported unit may be used.

2.3 TYPE 2 ISOLATORS (PAD AND HANGER TYPE)

A. Molded isolators shall come in a range of 30 to 70 durometer and shall be designed for up to ½" deflection.

B. Hangers shall be designed for a 20° to 35° misalignment.

2.4 TYPE 3 ISOLATORS (SPRINGS)

A. Freestanding, Unhoused, Laterally Stable Steel Springs with leveling bolts and ¼-in. thick ribbed isolation pads. To assure stability, the spring shall have a lateral spring stiffness equal to the rated vertical stiffness, and shall be designed to provide 50% overload capacity. In capacities up to 5,000 lbs., springs shall be replaceable. In capacities over 5,000 lbs., springs shall be welded to the top and bottom load plate assemblies.

B. Combination Spring and Rubber Hangers. The pre-compressed fiberglass shall be coated with a moisture impervious elastomeric membrane in series with springs, all encased in welded steel brackets. Springs shall be as specified for Type 3 isolators. Hangers shall be designed for 50% overload capacity, and shall accommodate rod misalignment over a 30° arc. Brackets shall be designed to carry 500% overload without failure.

2.5 TYPE 4 ISOLATORS

A. Freestanding, Laterally Stable Spring Isolators with vertical limit stops to assure a constant operating height if the supported weight is removed, and to reduce movement due to wind loads. Limit stops shall be isolated from the housing to prevent short-circuiting.

2.6 TYPE A BASES

A. No base required. Isolators may be attached directly to the supported equipment.

2.7 TYPE B BASES

A. Structural Steel Base, designed and supplied by reducing the mounting height of equipment. To assure adequate stiffness, the height of the members shall be a minimum of 8% of the longest span between isolators, or at least 6 inches. Where thinner sections are necessary due to head room limitations, the section modulus of the members selected shall be equivalent to or exceed the section modulus of wide flange steel members whose thickness is 8% of the longest span between isolators.

2.8 TYPE C BASES

A. Reinforces Concrete Inertia Base, the steel members of which are designed and supplied by the isolator manufacturer. The concrete shall be poured into a welded steel frame with pre-located equipment anchor bolts, ½-in. diameter reinforcing bars on nominal 8-in. centers each way, and recessed isolator mounting brackets to reduce the mounting height of the equipment, but yet remain within the confines of the base. The thickness of the base shall be a minimum of 8% of the longest span between isolators, at least 6 in., or as indicated on the drawings. Where inertia bases are used to mount pumps, the bases shall be wide enough to support piping elbows.

2.9 TYPE D BASES

A. Roof Curb Isolators: Fabricated frame units sized to match roof curbs as shown, formed with isolation springs between extruded aluminum upper and lower sections, which are shaped and positioned to prevent metal-to-metal contact. Provide continuous airtight and waterproof seal between upper and lower extrusions. Include provisions for anchorage of frame unit to roof curb, and for anchorage of equipment to unit. Equivalent to Mason Type CMAB or RSC as required.

2.10 DUCTWORK ISOLATION

A. Provide flexible duct connections wherever ductwork connects to vibration isolated equipment. Construct flexible connections of neoprene-coated flameproof fabric crimped into duct flanges for attachment to duct and equipment. Make airtight joint. Provide adequate joint flexibility to allow for thermal, axial, transverse, and torsional movement, and also capable of absorbing vibrations of connected equipment.

B. Manufacturer: Subject to compliance with requirements, provide flexible connections of one of the following:

1. Elgen Manufacturing Co.
2. Duro Dyne Corporation
3. Ventfabrics, Inc.

2.11 PIPING ISOLATION

A. Piping over 1 in. diameter in mechanical equipment rooms, and piping three supports away from other mechanical equipment shall be isolated from the structure by means of vibration and noise isolators.

B. Suspended piping shall be isolated with Type 2 Hangers.

C. Floor mounted piping shall be isolated with Type 2 Isolators (spring mounts).

D. Flexible members shall be incorporated in the piping adjacent to all equipment housing pipe connections (cooling tower, unit heaters, air handling units, chillers, etc.).

2.12 PUMP CONNECTORS

A. Provide flexible connectors at suction and discharge of circulating pumps.

B. Pipe connectors shall be 18 in. for pipe sizes 6 in. and larger, and 12 in. for smaller pipes.

C. Pipe connectors shall be of Butyl rubber material with reinforced carcasses and integral rubber and duck flanges. Connectors shall be suitable for 200-degree water at 150 psi working pressure.

D. Protection against elongation shall be provided by tie rod control units with rubber grommets.

E. Pipe connectors shall be Type 150 B with split galvanized retaining ring as manufactured by Mercer or approved equivalent.

2.13 ELECTRICAL CONNECTIONS TO RESILIENTLY MOUNTED EQUIPMENT

A. Electrical connections to equipment which is supported or suspended by vibration isolators shall be made with long lengths of flexible conduit or flexible armored cable. These flexible connections must be located so as to prevent rigid conduit connections between the resiliently mounted equipment and the building structure.

2.14 VIBRATION ISOLATION SCHEDULE

EQUIPMENT TYPE	**ON GRADE**		**UP TO 20 FT FLR SPAN**		**20 TO 30FT FLR SPAN**		**20 TO 30FT FLR SPAN**	
REFRIGERATION MACHINES & CHILLERS	TYPE B-I	MIN DFL	TYPE B-I	MIN DFL	TYPE B-I	MIN DFL	TYPEB-I	MIN DFL
BARE COMPRESSORS	A-2	0.25	C-3	0.75	C-3	1.75	C-4	2.50
RECIPROCATING	A-2	0.25	A-4	0.75	A-3	1.75	A-4	2.50
CENTRIFUGAL	A-1	0.25	A-4	0.75	A-3	1.75	A-3	1.75
OPEN CENTRIFUGAL	A-1	0.25	A-4	0.75	A-3	1.75	A-3	1.75
ABSORPTION	A-1	0.25	A-4	0.75	A-3	1.75	A-3	1.75
AIR COMPRESSORS & VACUUM PUMPS	TYPE B-I	MIN DFL	TYPE B-I	MIN DFL	TYPE B-I	MIN DFL	TYPE B-I	MIN DFL
TANK MOUNTED < OR =10 HP	A-3	0.75	A-3	0.75	A-3	1.75	A-3	1.75
TANK MOUNTED > OR =15 HP	C-3	0.75	C-3	0.75	C-3	1.75	C-3	1.75
BASE MOUNTEDD	C-3	0.75	C-3	0.75	C-3	1.75	C-3	1.75
LARGE RECIPROCATING	C-3	0.75	C-3	0.75	C-3	1.75	C-3	1.75
PUMPS, CLOSE COUPLED	TYPE B-I	MIN DFL	TYPE B-I	MIN DFL	TYPE B-I	MIN DFL	TYPE B-I	MIN DFL
< OR = 7.5 HP	B-2	0.25	C-3	0.75	C-3	0.75	C-3	0.75
> OR = 10 HP	C-3	0.75	C-3	0.75	C-3	1.75	C-3	1.75
PUMPS, END SUCTION AND SPLIT CASE	TYPE B-I	MIN DFL	TYPE B-I	MIN DFL	TYPE B-I	MIN DFL	TYPE B-I	MIN DFL
<50 HP	C-3	0.75	C-3	0.75	C-3	1.75	A-3	1.75
50 - 125 HP	C-3	0.75	C-3	0.75	C-3	1.75	C-3	2.50
>125 HP	C-3	0.75	C-3	1.75	C-3	1.75	C-3	2.50
COOLING TOWERS	TYPE B-I	MIN DFL	TYPE B-I	MIN DFL	TYPE B-I	MIN DFL	TYPE B-I	MIN DFL
<= 300 RPM	A-1	0.25	A-4	3.50	A-4	3.50	A-4	3.50
301 - 500 RPM	A-1	0.25	A-4	2.50	A-4	2.50	A-4	2.50
>500 RPM	A-1	0.25	A-4	0.75	A-4	0.75	A-4	1.75

BOILERS	TYPE B-I	MIN DFL	TYPE B-I	MIN DFL	TYPE B-I	MIN DFL	TYPE B-I	MIN DFL
FIRETUBE	A-1	0.25	B-4	0.75	B-4	1.75	B-4	2.50
AXIAL FANS, FAN HEADS, CABINET FANS & FAN SECTIONS	TYPE B-I	MIN DFL	TYPE B-I	MIN DFL	TYPEB-I	MIN DFL	TYPE B-I	MIN DFL
< OR = 22 IN. DIA.	A-2	0.25	A-3	0.75	A-3	0.75	C-3	0.75
>=24 IN.DIA., <=2 IN.S.P. & <=300 RPM	B-3	2.50	C-3	3.50	C-3	3.50	C-3	3.50
>=24 IN.DIA., <=2 IN.S.P. & 300 - 500RPM	B-3	0.75	B-3	1.75	C-3	2.50	C-3	2.50
>=24 IN.DIA., <=2 IN.S.P. & >500 RPM	B-3	0.75	B-3	1.75	B-3	1.75	B-3	1.75
>=24 IN.DIA., >=2 IN.S.P. & <=300 RPM	C-3	2.50	C-3	3.50	C-3	3.50	C-3	3.50
>=24 IN.DIA., >=2 IN.S.P. & 300 - 500RPM	C-3	1.75	C-3	1.75	C-3	2.50	C-3	2.50
>=24 IN.DIA., >=2 IN.S.P. & >500 RPM	C-3	0.75	C-3	1.75	C-3	1.75	C-3	2.50
CENTRIFUGAL FANS	TYPE B-I	MIN DFL	TYPE B-I	MIN DFL	TYP B-I	MIN DFL	TYPE B-I	MIN DFL
< OR = 22 IN. DIA.	B-2	0.25	B-3	0.75	B-3	0.75	C-3	1.75
>=24 IN.DIA., <=2 IN.S.P. & <=300 RPM	B-3	2.50	B-3	3.50	B-3	3.50	B-3	3.50
>=24 IN.DIA., <=2 IN.S.P. & 300 - 500RPM	B-3	1.75	B-3	1.75	B-3	2.50	B-3	2.50
>=24 IN.DIA., <=2 IN.S.P. & >500 RPM	B-3	0.75	B-3	0.75	B-3	0.75	B-3	1.75
>=24 IN.DIA., >=2 IN.S.P. & <=300 RPM	C-3	2.50	C-3	3.50	C-3	3.50	C-3	3.50
>=24 IN.DIA., >=2 IN.S.P. & 300 - 500RPM	C-3	1.75	C-3	1.75	C-3	2.50	C-3	2.50
>=24 IN.DIA., >=2 IN.S.P. & >500 RPM	C-3	1.00	C-3	1.75	C-3	1.75	C-3	2.50
PROPELLER FANS	TYPE B-I	MIN DFL	TYPE B-I	MIN DFL	TYPE B-I	MIN DFL	TYPE B-I	MIN DFL
WALL MOUNTED	A-1	0.25	A-1	0.25	A-1	0.25	A-1	0.25
ROOF MOUNTED	A-1	0.25	A-1	0.25	B-4	1.75	D-4	1.75
HEAT PUMPS	TYPE B-I	MIN DFL	TYPE B-I	MIN DFL	TYPE B-I	MIN DFL	TYPE B-I	MIN DFL
HEAT PUMPS	A-3	0.75	A-3	0.75	A-3	0.75	A/D-3	1.75
CONDENSING UNITS	TYPE B-I	MIN DFL	TYPE B-I	MIN DFL	TYPE B-I	MIN DFL	TYPEB-I	MIN DFL
CONDENSING UNITS	A-1	0.25	A-4	0.75	A-4	1.75	A/D-4	1.75

PACKAGED AH, AC, H AND V UNITS	TYPE B-I	MIN DFL	TYPE B-I	MIN DFL	TYPE B-I	MIN DFL	TYPEB-I	MIN DFL
< OR = 10 HP.	A-3	0.75	A-3	0.75	A-3	0.75	A-3	0.75
>=15 HP, <=4 IN.S.P. & <=300 RPM	A-3	0.75	A-3	3.50	A-3	3.50	C-3	3.50
>=15 HP, <=4 IN.S.P. & 300 - 500RPM	A-3	0.75	A-3	2.50	A-3	2.50	A-3	2.50
>=15 HP, <=4 IN.S.P. & >500 RPM	A-3	0.75	A-3	1.75	A-3	1.75	A-3	1.75
>=15 HP, >=4 IN.S.P. & <=300 RPM	B-3	0.75	C-3	3.50	C-3	3.50	C-3	3.50
>=15 HP, >=4 IN.S.P. & 300 - 500RPM	B-3	0.75	C-3	1.75	C-3	2.50	C-3	2.50
>=15 HP, >=4 IN.S.P. & >500 RPM	B-3	0.75	C-3	1.75	C-3	1.75	C-3	2.50

PACKAGED ROOFTOP EQUIPMENT	TYPE B-I	MIN DFL	TYPEB-I	MIN DFL	TYPE B-I	MIN DFL	TYPE B-I	MIN DFL
PACKAGED ROOFTOP EQUIPMENT	A/D-1	0.25	D-3	0.75				

DUCT ROTATING EQUIPMENT	TYPE B-I	MIN DFL	TYPE B-I	MIN DFL	TYPE B-I	MIN DFL	TYPE B-I	MIN DFL
SMALL FANS, FAN-POWERED BOXES								
<= 600 CFM	A-3	0.50	A-3	0.50	A-3	0.50	A-3	0.50
> 600 CFM	A-3	0.75	A-3	0.75	A-3	0.75	A-3	0.75

ENGINE DRIVEN GENERATORS	TYPE B-I	MIN DFL	TYPE B-I	MIN DFL	TYPE B-I	MIN DFL	TYPE B-I	MIN DFL
ENGINE DRIVEN GENERATORS	A-1	0.75	C-3	1.75	C-3	2.50	C-3	3.50

BASE TYPES:	**ISOLATOR TYPES:**
A. NO BASE, ISOLATORS ATTACHED DIRECTLY TO EQUIPMENT	1. PAD, RUBBER, OR GLASS FIBER
B. +PAD, RUBBER, OR GLASS FIBER	2. RUBBER FLOOR ISOLATOR OR HANGER
C. CONCRETE INERTIA BASE	3. SPRING FLOOR ISOLATOR OR HANGER
D. CURB-MOUNTED BASE	4. RESTRAINED SPRING ISOLATOR
	5. THRUST RESTRAINT (SEE ASHRAE HANDBOOK)

PART 3 INSTALLATION

3.1 EXECUTION

A. General: Except as otherwise indicated, comply with manufacturer's instructions for the installation and load application to vibration isolation materials and units. Adjust to ensure that units do not exceed rated operating deflections or bottom out under loading, and are not short-circuited by other contacts or bearing points. Remove space blocks and similar devices (if any) intended for temporary protection against overloading during installation.

B. Anchor and attach units to substrate and equipment as required for secure operation and to prevent displacement by normal forces, and as indicated.

C. Adjust leveling devices as required to distribute loading uniformly onto isolators. Shim units as required where leveling devices cannot be used to distribute loading properly.

D. Flexible Pipe Connectors: Refer to other section of these Specifications for the installation of flexible pipe connectors.

E. Install vibration isolators that are furnished with equipment.

END OF SECTION

SECTION 23 0553
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Provide materials, equipment labor and supervision necessary to install piping identification products.

B. Comply with ANSI A13.1 for lettering size, length or color field, colors, and installed viewing angles of identification devices.

1.2 QUALIFICATIONS

A. Brady Corp., Industrial Safety Supply, Emedco, Seton or Brimar.

1.3 SCHEDULES

A. Submit valve and damper schedule for each system, typewritten and reproduced on 8-1/2" x 11" bond paper. Tabulate valve and damper number, system, system abbreviation (as shown on tag), location of valve and damper (room or space), and variations for identification (if any). Mark valves and dampers that are intended for emergency shut-off and similar special uses, by special "flags", in margin of schedule.

1.4 SUBMITTALS

A. Submit manufacturer's product data.

B. Submit sample of each type of identification product and clearly identify the contents in a schedule.

PART 2 PRODUCTS

2.1 PIPE MARKERS

A. Provide manufacturer's standard preprinted, semi-rigid snap-on or self-sticking, color-coded pipe markers, complying with ANSI A13.1.

B. Provide full-band pipe markers, extending 360° around pipe at each location or self-sticking pipe markers, fastened in the following method:

1. Snap-on application of pre-tensioned semi-rigid plastic pipe marker.
2. Secure to piping and install banding tape on both ends of each pipe label.

C. Lettering shall be manufacturer's pre-printed nomenclature which best describes piping system in each instance, as selected by Architect/Engineer in cases of variance.

D. Print each pipe marker with arrows indicating direction of flow, integrally with piping system service lettering (to accommodate both directions), or as separate unit of plastic or on banding tape.

2.2 EQUIPMENT MARKERS

A. Provide engraved signage nameplates and tags constructed of multi-layered acrylic that has been treated for outdoor use and can withstand temperatures up to 160° F. Nameplates shall have beveled edges with contrasting color core, letters, and border. Minimum size of nameplate shall be 3" high by 6" long. The minimum letter height shall be 3/4". Attachment shall be by double faced 2 mil permanent acrylic adhesive. For equipment that doesn't allow for direct attachment, furnish sheet metal backing to integrate with equipment such that signage can be read from 5 feet above the finished floor. Unless noted otherwise, signage shall be provided with black lettering, black border, and yellow core. All signage shall include up to 14 characters per line, minimum of 3 lines per tag. Furnish signage for equipment shown in Section 3:

1. All pumps shall include the full name description for system served such as *"Primary Chilled Water Pump – 1."*
2. All air handling unit filter sections shall be labeled with the exact quantity of filters, size, and type of filter such as *"14 – 24"x24"x2", 30% Pleated Filters."*

B. All equipment shall be named consistent with the plans and specifications as indicated on the schedules or as directed by the Owner.

2.3 BRASS VALVE AND DAMPER TAGS

A. Provide manufacturer's standard brass valve and damper tags with stamped black filled lettering, with piping system abbreviation in 1/4" high letters and sequenced valve numbers 1/2" high, and with 3/16" hole for fastener.

B. Provide 1-1/2" round brass tags with black lettering. Seton 250 BL or equal.

2.4 VALVE AND DAMPER TAG FASTENERS

A. Manufacturer's standard solid brass chain or solid brass S-hooks of sizes required for proper attachment of tags to valves and dampers, and manufactured specifically for that purpose.

2.5 VALVE AND DAMPER SCHEDULE FRAMES

A. For each page of schedule, provide glazed display frame, with screws for removable mounting on masonry walls. Provide frames of finished hardwood or extruded aluminum, with SSD-grade sheet glass.

PART 3 EXECUTION

3.1 INSTALLATION OF MECHANICAL IDENTIFICATION

A. Where identification is to be applied to surfaces that require insulation, painting or other covering or finish, including valve tags in finished mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.

B. Install pipe markers on each system, and include arrows to show normal direction of flow.

C. Locate pipe markers as follows: wherever piping is exposed to view in occupied spaces, machine rooms, accessible maintenance spaces (shafts, tunnels, plenums) above lay-in type ceilings and exterior non-concealed locations.

1. Near each valve and control device.

2. Near each branch, excluding short take-offs for fixtures, mark each pipe at branch where there could be question of flow pattern.
3. Near locations where pipes pass through walls or floors/ceilings, (both sides) or center non-accessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. At each pipe passage to underground.
7. Spaced intermediately at maximum spacing of 50' along each piping run, except reduce spacing to 25' in congested areas of piping and equipment.
8. On piping above removable acoustical ceilings, maximum spacing of 20' along each piping run.
9. Where self-sticking labels are used, the pipe or its covering surface shall be properly prepared. This consists of removal of loose dirt, oil and grease, loose paint or peeling insulation covering. This can be done with a brush and cloth; washing is not required. Use solvent for removal of oil or grease.
10. Banding tape must be used on both ends of all self-sticking labels. The tape shall encircle the pipe completely and overlap itself so the banding tape can adhere to itself.

D. Provide valve tags for all major valves 3/4" size or larger. Included are all main, zone and branch valves, valves in all equipment rooms, etc. All types of valves, ball, globe, butterfly, cocks, control, regulating, relief, reducing, solenoid, etc. are to be identified except check valves. Do not identify end use point valves for plumbing fixtures, and similar rough-in connections.

E. Provide damper tags on all automatic control dampers, motorized dampers, and smoke dampers.

F. List each tagged valve and damper in schedule for each system showing function and location. Provide separate charts for mechanical divisions of work. Charts shall be installed on a conspicuous wall in the main mechanical equipment room. Provide unframed copies of valve and damper lists as part of closeout documents.

3.2 ADJUSTING AND CLEANING

A. Relocate any mechanical identification device which has become visually blocked by work of this division or other divisions.

B. Clean face of identification devices and glass frames of valve schedules.

3.3 PIPING DUCTWORK, AND EQUIPMENT IDENTIFICATION

A. Piping systems that shall be identified by their controls (including directional arrows) on this project shall include, but are not necessarily limited to, the following:

1. Chilled water (supply and return).
2. Heating water (supply and return).
3. Low, Medium, and Highpressure steam. Indicate pressure on 50' intervals.
4. Steam condensate return.
5. Pumped condensate.
6. Run-around loop heat recovery piping.

B. Equipment/Ductwork

1. Outdoor air intake plenums.
2. Air handling unit sections.
3. Air separator.
4. Pumps.
5. Chillers.
6. Fan Coil Units.
7. Blower Coils.
8. Exhaust fans.
9. Glycol Feeders.
10. Directional arrows indicating flow of air at discharge and inlet of air handling units.
11. Provide name plates for all equipment scheduled on the drawings. Coordinate nameplate tag with Owner's sequencing system. If the Owner has no preference, the nameplates shall correspond with the equipment schedule.
12. All labeling for the machinery refrigeration room shall be in accordance with ASHRAE 15.

END OF SECTION

SECTION 23 0593
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

B. Commissioning activities.

1.2 RELATED REQUIREMENTS

A. Section 01 4000 - Quality Requirements: Employment of testing agency and payment for services.

1.3 REFERENCE STANDARDS

A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition; 2016.

B. ASHRAE Std 110 - Methods of Testing Performance of Laboratory Fume Hoods; 2016, with Errata.

C. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2008, with Errata (2019).

D. NEBB (TAB) - Procedural Standard for Testing, Adjusting and Balancing of Environmental Systems; 2019, with Errata (2022).

E. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2002.

1.4 SUBMITTALS

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

B. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.

1. Submit to Architect/Engineer/Engineer.
2. Submit to the Commissioning Authority.
3. Submit six weeks prior to starting the testing, adjusting, and balancing work.
4. Include certification that the plan developer has reviewed Contract Documents, the equipment and systems, and the control system with the Architect/Engineer and other installers to sufficiently understand the design intent for each system.
5. Include at least the following in the plan:

a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.

b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.

c. Discussion of what notations and markings will be made on the duct and piping drawings during the process.

d. Final test report forms to be used.

e. Detailed step-by-step procedures for TAB work for each system and issue, including:
   1) Terminal flow calibration (for each terminal type).
   2) Diffuser proportioning.
   3) Branch/submain proportioning.
   4) Total flow calculations.
   5) Rechecking.
   6) Diversity issues.

f. Expected problems and solutions, etc.

g. Criteria for using air flow straighteners or relocating flow stations and sensors; analogous explanations for the water side.

h. Details of how TOTAL flow will be determined; for example:
   1) Air: Sum of terminal flows via control system calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations.
   2) Water: Pump curves, circuit setter, flow station, ultrasonic, etc.

i. Specific procedures that will ensure that both air and water side are operating at the lowest possible pressures and methods to verify this.

j. Confirmation of understanding of the outside air ventilation criteria under all conditions.

k. Method of verifying and setting minimum outside air flow rate will be verified and set and for what level (total building, zone, etc.).

l. Method of checking building static and exhaust fan and/or relief damper capacity.

m. Proposed selection points for sound measurements and sound measurement methods.

n. Methods for making coil or other system plant capacity measurements, if specified.

o. Time schedule for TAB work to be done in phases (by floor, etc.).

p. Description of TAB work for areas to be built out later, if any.

q. Time schedule for deferred or seasonal TAB work, if specified.

r. False loading of systems to complete TAB work, if specified.

s. Exhaust fan balancing and capacity verifications, including any required room pressure differentials.

t. Interstitial cavity differential pressure measurements and calculations, if specified.

u. Procedures for field technician logs of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests (scope and frequency).

v. Procedures for formal progress reports, including scope and frequency.

w. Procedures for formal deficiency reports, including scope, frequency and distribution.

C. Field Logs: Submit at least twice a week to the Commissioning Authority.

D. Control System Coordination Reports: Communicate in writing to the controls installer all setpoint and parameter changes made or problems and discrepancies identified during TAB that affect, or could affect, the control system setup and operation.

E. Progress Reports.

F. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.

1. Submit under provisions of Section 01 4000.
2. Submit to the Commissioning Authority within two weeks after completion of testing, adjusting, and balancing.
3. Revise TAB plan to reflect actual procedures and submit as part of final report.
4. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect/Engineer and for inclusion in operating and maintenance manuals.
5. Provide report in PDF, Excel, or Word format, complete with cover page.
6. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets.
7. Include set of reduced drawings indicating thermostat locations.
8. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
9. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
10. Units of Measure: Report data in both I-P (inch-pound) and SI (metric) units.
11. Include the following on the title page of each report:
    a. Name of Testing, Adjusting, and Balancing Agency.
    b. Address of Testing, Adjusting, and Balancing Agency.
    c. Telephone number of Testing, Adjusting, and Balancing Agency.
    d. Project name.
    e. Project location.
    f. Project Architect/Engineer.
    g. Project Engineer.
    h. Project Contractor.
    i. Project altitude.
    j. Report date.

G. Project Record Documents: Record actual locations of flow measuring stations and balancing valves and rough setting.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:

1. SMACNA (TAB).

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C. TAB Agency Qualifications:

1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
2. Certified by one of the following:
    a. AABC, Associated Air Balance Council: upon completion submit AABC National Performance Guaranty.
    b. NEBB, National Environmental Balancing Bureau: www.nebb.org/#sle.
    c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org/#sle.

D. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

E. OTHER CONTRACTOR RESPONSIBILITIES

1. Putting complete system into operation during duration of balancing period.
2. Providing labor and equipment and cost of performing corrections such as dampers, belts, and pulley changes, etc. as required without undue delay.
3. Providing complete submittal information for mechanical equipment complete with pertinent engineering information.

3.2 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:

1. Systems are started and operating in a safe and normal condition.
2. Temperature control systems are installed complete and operable.
3. Proper thermal overload protection is in place for electrical equipment.
4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
5. Duct systems are clean of debris.
6. Fans are rotating correctly.
7. Fire and volume dampers are in place and open.
8. Air coil fins are cleaned and combed.
9. Access doors are closed and duct end caps are in place.
10. Air outlets are installed and connected.

11. Duct system leakage is minimized.
12. Hydronic systems are flushed, filled, and vented.
13. Pumps are rotating correctly.
14. Proper strainer baskets are clean and in place.
15. Service and balance valves are open.

B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.

C. Beginning of work means acceptance of existing conditions.

3.3 ADJUSTMENT TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3.4 RECORDING AND ADJUSTING

A. Field Logs: Maintain written logs including:

1. Running log of events and issues.
2. Discrepancies, deficient or uncompleted work by others.
3. Contract interpretation requests.
4. Lists of completed tests.

B. Ensure recorded data represents actual measured or observed conditions.

C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

D. Mark on drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.

E. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

G. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

3.5 AIR SYSTEM PROCEDURE

A. Air ducts with electric heating coils shall be adjusted to allow coil to energize at minimum airflow conditions.

3.6 COMMISSIONING

A. Perform prerequisites prior to starting commissioning activities.

B. Fill out Prefunctional Checklists for:

1. Air side systems.
2. Water side systems.

C. Furnish to the Commissioning Authority, upon request, any data gathered but not shown in the final TAB report.

D. Re-check minimum outdoor air intake flows and maximum and intermediate total airflow rates for 25 percent of the air handlers plus a random sample equivalent to 20 percent of the final TAB report data as directed by Commissioning Authority.

1. Original TAB agency shall execute the re-checks, witnessed by the Commissioning Authority.
2. Use the same test instruments as used in the original TAB work.
3. Failure of more than 10 percent of the re-checked items of a given system shall result in the rejection of the system TAB report; rebalance the system, provide a new system TAB report, and repeat random re-checks.
4. For purposes of re-check, failure is defined as follows:
    a. Air Flow of Supply and Return: Deviation of more than 10 percent of instrument reading.
    b. Minimum Outside Air Flow: Deviation of more than 20 percent of instrument reading; for inlet vane or VFD OSA compensation system using linear proportional control, deviation of more than 30 percent at intermediate supply flow.
    c. Temperatures: Deviation of more than one degree F (0.5 degree C).
    d. Air and Water Pressures: Deviation of more than 10 percent of full scale of test instrument reading.
    e. Sound Pressures: Deviation of more than 3 decibels, with consideration for variations in background noise.
5. For purposes of re-check, a whole system is defined as one in which inaccuracies will have little or no impact on connected systems; for example, the air distribution system served by one air handler or the hydronic chilled water supply system served by a chiller or the condenser water system.

E. In the presence of the Commissioning Authority, verify that:

1. Final settings of all valves, splitters, dampers and other adjustment devices have been permanently marked.
2. The air system is being controlled to the lowest possible static pressure while still meeting design loads, less diversity; this shall include a review of TAB methods, established control setpoints, and physical verification of at least one leg from fan to diffuser having all balancing dampers wide open and that during full cooling of all terminal units taking off downstream of the static pressure sensor, the terminal unit on the critical leg has its damper 90 percent or more open.
3. The water system is being controlled to the lowest possible pressure while still meeting design loads, less diversity; this shall include a review of TAB methods, established control setpoints, and physical verification of at least one leg from the pump to the coil having all balancing valves wide open and that during full cooling the cooling coil valve of that leg is 90 percent or more open.

3.7 MINIMUM DATA TO BE REPORTED

A. Air Moving Equipment:

1. Air flow, specified and actual.

B. Unit Heaters, Fin-tube, etc.:

1. Unit type, manufacturer, model no., etc.
2. Entering and leaving air temperature
3. Entering water temperature (design and final)
4. Entering and leaving water pressure (design and final) (provide if a water flow station is not provided)
5. Water flow (GPM)
6. Electrical data

C. Air Distribution Tests (Diffusers, Registers, and Grilles):

1. Design air flow.
2. Test (final) air flow.

END OF SECTION

SECTION 23 0700
HVAC INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Provide equipment, materials, labor and supervision necessary to install insulation to hot and cold surfaces of piping, tanks, ductwork, fittings and other surfaces.

B. Insulation shall include insulating materials, jackets, adhesive, mastic coatings, tie wire and other materials as required to complete the insulating work.

1.2 CODES AND STANDARDS

A. Insulating materials, jackets and mastics shall meet flame spread, fuel contribution and smoke developed ratings in accordance with NFPA-90A. Flame spread rating in accordance with NFPA 255, ASTM E-84 or UL 723 of not more than 25; smoke developed rating of not more than 50, unless otherwise noted in this section.

B. Insulation that has been treated with a flame-retardant additive to meet the flame spread and smoke developed ratings shown above is not permitted.

C. Insulation materials shall be noncorrosive to the materials they are applied to, including stress corrosion cracking of stainless steel, and shall not breed or promote fungus and bacteria.

D. Insulation shall meet or exceed all requirements of the 2012 International Energy Conservation Code.

1.3 QUALIFICATION

A. Insulating materials by Owens-Corning, Aracell, Pittsburgh-Corning, Knauf, Johns Manville, or approved equivalent.

B. Mastics and adhesives as recommended by insulation manufacturer.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instructions for each type of mechanical insulation. Submit schedule showing manufacturer's product number, flame spread and smoke development rating, k-value, density, temperature limitations, sound absorption coefficients, thickness, and furnished accessories for each mechanical system requiring insulation.

PART 2 PRODUCTS

2.1 PRODUCTS

A. Description:

1. Type A: Preformed, sectional, heavy density fiberglass insulation, suitable for operating temperatures form –20° F to +850° F. Equipped with factory-applied, all-service vapor barrier jacket constructed of white Kraft paper bonded to aluminum foil reinforced with fiberglass yarn, with pressure-sensitive, self-sealing longitudinal laps and butt strips. Thermal conductivity of 0.23 BTU-in/hr-ft2-°F @ 75° F mean temperature. Water vapor permeance of 0.02 perms. Johns Manville "Micro-Lok HP or approved equivalent.

Mean Temperature Rating (F)	Conductivity BTU in/(hr sqft F)
250	0.32 - 0.34
200	0.29 - 0.32
150	0.27 - 0.30
125	0.25 - 0.29
100	0.21 - 0.28
75	0.21 - 0.28

2. Type B: Flexible, elastomeric pipe and sheet insulation with closed-cell structure. Shall comply with ASTM C534, Type I, Grade 1 for tubular materials and ASTM C534 Type II, Grade 1 for sheet materials. Suitable for operating temperatures from –40° F to 220° F. Outdoor applications, and where otherwise noted, shall receive a weather-resistant, protective, latex enamel finish. Thermal conductivity of 0.28 BTU-in/hr-ft2-°F @ 75° F mean temperature. Water vapor permeance of 0.08 perms. Insulation shall be equivalent to Armacell AP Armaflex; adhesive equivalent to Armacell Armaflex 520 or Armaflex 520 BLV Low-VOC Contact Adhesive; finish equivalent to Armacell Armaflex WB finish.
3. Type C: Flexible, elastomeric thermal insulation with an expanded, closed-cell structure. Pre-slit tubular form with a pressure-sensitive adhesive strip for closure and vapor sealing of the longitudinal joint. Butt joints, sealed with 3M-471 tape. White color. Suitable for operating temperature of 40° F to 200° F. Thermal conductivity of 0.28 BTU-in/hr-ft2-°F mean temperature. Water vapor permeance of 0.20 perms. Insulation shall be Armacell Self-Seal Armaflex 2000 or approved equivalent.
4. Type D: Preformed, rigid, expanded, 90% closed-cell polyisocyanurate suitable for operating temperatures of –320° F to +300° F. Equipped with factory applied, all-service vapor barrier jacket constructed of white Kraft paper bonded to aluminum foil reinforced with fiberglass yarn, with pressure-sensitive, self-sealing longitudinal laps and butt strips. Thermal conductivity for aged material of 0.18 BTU-in/hr-ft2-°F @ 75° F mean temperature. Water vapor permeance of 0.02 perms. Thermacor "CTI" or approved equivalent.
5. Type E: Preformed, rigid, cellular glass for operating temperature of –290° F to +1000° F. Thermal conductivity of 0.35 BTU-in/hr-ft2-°F @ 75° F mean temperature. Water vapor permeance of 0.00 perms. Pittsburgh-Corning "FOAMGLAS" or approved equivalent.
6. Type F: Hydrous calcium silicate, premolded, asbestos-free, suitable for applications up to 1200° F. Thermal conductivity of .45 BTU-in/hr-ft2-°F @ 300° F mean temperature. Insulation shall have low chloride content such that it will not cause or promote stress corrosion cracking of stainless steel. Schuller "Thermo-12 RainJacket " or approved equivalent.
7. Type G: Semi-rigid fiberglass board with factory applied foil Skrim-Kraft (FSK) suitable for operating temperature of –20° F to +650° F. Thermal conductivity of 0.27 BTU-in/hr-ft2-°F @ 75° F mean temperature. Water vapor permeance of 0.02 perms. Knauf "Pipe and Tank" insulation or approved equivalent.
8. Type H: Rigid fiberglass board formed from inorganic glass fibers bonded with thermosetting fibers, 3.0 PCF, with factory applied foil Skrim-Kraft (FSK)foil Skrim-Kraft (FSK) suitable for operating temperature of –20° F to +450° F. Thermal conductivity of 0.23 BTU-in/hr-ft2-°F @ 75° F mean temperature. Water vapor permeance of 0.02 perms. Knauf "Insulation Board" or approved equivalent.

9. Type I: Fiberglass duct wrap, 1.5 PCF density, fabricated of inorganic glass fibers bonded with thermosetting resin with factory applied foil Skrim-Kraft facing, suitable for operating temperature up to +250° F. Thermal conductivity of 0.26 BTU-in/hr-ft2-°F @ 75° F mean temperature. Water vapor permeance of 0.02 perms. Knauf Duct Wrap or engineer approved equivalent.
10. Type J: Flexible fiberglass duct liner, 1.5 PCF density, fabricated of inorganic glass fibers bonded with thermosetting resin, with mat face suitable for air velocities up to 4000 FPM and operating temperatures up to +250° F. Thermal conductivity of 0.25 BTU-in/hr-ft2-°F @ 75° F mean temperature. Knauf "Duct Liner E-M" or engineer approved equivalent.
11. Type K: Rigid fiberglass duct liner, 3.0 PCF density, fabricated of inorganic glass fiber bonded with thermosetting resin, with black polymer facing suitable for air velocities up to 4000 FPM and operating temperatures up to +250° F. Thermal conductivity of 0.23 BTU-in/hr-ft2-°F @ 75° F mean temperature. Knauf "Rigid Duct Liner" or engineer approved equivalent.
12. Type L: Fire protective grease duct wrap, two-hour fire-rated, zero-inch clearance to combustibles, compliant with UL 1978, NFPA 96, and ASTM E119. Thermal Ceramics Fire Master Duct System with duct wrap, duct fire stop and all required accessories. Service range to 2300° F, melting point 3200° F, foil-faced.
13. Type M: Plenum wrap for use on PVC, CPVC, PB, PE, PP, PVDF, and ABS pipe in return air plenums. Material shall be tested to the UL 910 requirements (flammability test). When material covers PVC, the optical smoke density shall average .01 or less. The flame propagation shall not exceed 2.6. ASTM E84 flame spread and smoke developed rating shall not exceed 5. Installation shall include all tie wires and foil tape. Install per manufacturer's written instructions. 3M Firemaster Plenum Wrap or approved equal.

2.2 INSULATION JACKETS

A. 20-mil high impact PVC secured with spray contact adhesive. All PVC jacketing shall meet the 25/50 SDR. Manville "Zeston 2000" or equivalent.

B. 6-oz/sq yd UL listed cotton canvas fabric secured with Childers CP50 lagging adhesive.

C. Fitting and valve jackets shall be premolded PVC with joints and seams sealed with a spray contact adhesive or vapor barrier mastic. Premolded jackets shall be Manville "Zeston 2000" or approved equivalent.

D. At wall penetrations and on exterior pipe, provide an additional jacket of 0.020 inch thick smooth finish aluminum. Metal jacket shall have factory applied moisture barrier. Fitting and valve covers to be preformed of same material as adjacent metal jacket

E. Where PVC or metal jackets are used, delete the factory applied ASJ on pipe and equipment operating above 75° F.

F. PVC jackets shall be used in the following areas and systems:

1. Whenever piping is routed exposed through occupied spaces.
2. Exposed piping in kitchens and dishwasher rooms.
3. Premolded PVC at all fittings and valve jackets.

PART 3 EXECUTION

3.1 INSTALLATION, GENERAL

A. Use only experienced applicators regularly engaged in the trade. Rough work will be rejected. Application details shall be in accordance with the insulation materials supplier's recommendations, except where a higher standard is specified.

B. Install materials after systems have been tested and approved. Material such as rust, scale, dirt and moisture shall be removed form surfaces to be insulated.

C. Insulation shall be kept clean and dry at all times.

D. Where pipes and ducts pass through fire rated walls, floors and partitions, a fire seal shall be provided.

E. When flexible cellular insulation is used, it shall be installed with seams and joints sealed with contact adhesive.

1. Wherever possible, the insulation shall be placed over the pipe before it is installed. Seal the butt joints with Armacell Armaflex 520, or Armaflex 520 BLV Low-VOC Contact Adhesive or equal.

2. Where the insulation cannot be slipped on, cut the insulation longitudinally and apply it to the piping. Seal longitudinal seam and butt joints with Armacell Armaflex 520 adhesive, or Armaflex 520 BLV Low-VOC Contact Adhesive or equal. In all cases, the insulation, equal to Armacell AP, protected with half-round PVC sleeves the length of three times the nominal pipe size, minimum length to be 8 inches.

3.2 PIPE INSULATION INSTALLATION

A. Insulate fittings, valves, unions, flanges, strainers, flexible connections and expansion joints with premolded or mitered segments of same insulating material as for adjacent pipe covering.

B. Pipe insulation shall continue through sleeves and hangers with vapor barrier and/or jacket.

C. Insert to be between support shield and piping but under the finish jacket. Provide an insert at hangars not less than 6 inches long, of same thickness and contour as adjoining insulation, to prevent insulation from sagging at support points. Inserts shall be heavy density insulating material suitable for the planned temperature range. Factory fabricated inserts may be used.

D. Neatly finish insulation at supports, protrusions and interruptions.

1. On hot systems where fittings are to be left exposed, insulation ends shall be beveled away from bolts for easy access.

2. On cold systems, valve stems shall be sealed with caulking which allows free movement of the stem, but provides a seal against moisture incursion.

E. For outdoor pipe insulation, increase pipe insulation thickness by ½" from thickness listed in schedule.

F. Wherever piping penetrates a floor or is exposed in a finished area such as kitchens, furnish a floor pipe escutcheon and/or PVC (white) jacket to protect insulation and allow for a smooth finish for cleaning.

3.3 EQUIPMENT INSULATION

A. Do not insulate factory-insulated equipment.

B. Apply insulation as close as possible to equipment by grooving, scoring and beveling insulation, if necessary. Secure insulation to equipment with studs, pins, clips, adhesive, wires or bands.

C. Fill joints, cracks, seams and depressions with bedding compound to form smooth surface. On cold equipment, use vapor barrier cement.

D. Cover insulation with metal mesh and finish with ¼" coat of insulating cement applied in two 1/8" layers, if non-faced insulation is used.

E. Do not insulate over nameplate or ASME stamps. Bevel and seal insulation around such.

F. When equipment with insulation requires periodical opening for maintenance, repair or cleaning such as at manway covers or strainer plugs, install insulation in such a manner that it can be easily removed and replaced without damage. Removable insulation shall have a vapor-proof cover fabricated so as to allow it to be resealed to the equipment vapor barrier.

G. Joints shall be sealed with 2" wide vapor barrier tape or strips to match insulation jacket, using a fire-resistive adhesive.

3.4 DUCT COVERING APPLICATION

A. Covering shall be cut slightly longer than circumference of duct to ensure full thickness at corners. Insulation shall be applied with edges tightly banded, and shall be adhered to duct with fire-resistant adhesive. Adhesive shall be applied so that insulation conforms to duct surfaces uniformly and firmly.

B. In addition to the adhesive, the insulation shall be additionally secured to the bottom of ducts 18" or wider by means of adhesive pins and speed clips. The protruding ends of the pins shall be cut off flush after the speed clips have been applied. The vapor barrier facing shall be thoroughly sealed with a vapor barrier mastic and tape where the pins have pierced through. The vapor barrier shall be continuous to prevent condensation. Insulation shall not be compressed at any location so as to reduce insulating characteristics.

C. Joints shall be sealed with 2" wide pressure-sensitive tape or vapor barrier tape or strips, using a fire-resistive adhesive. Cuts or tears shall be sealed with strips of vapor barrier jacket applied with adhesive or pressure-sensitive tape.

3.5 EQUIPMENT INSULATION SCHEDULE

SERVICE	TYPE	THICKNESS
Hot Water Storage Tanks < 28" Diameter	A	1-1/2"
Hot Water Storage Tanks > or = 28" Diameter	I	1-1/2"
Cold Water Storage Tanks< 28" Diameter	A	1-1/2"
Cold Water Storage Tanks > or = 28" Diameter	I	1-1/2'
Heat Exchanger / Converters < 28" Diameter	A	1-1/2"
Heat Exchanger / Converters > or = 28" Diameter	I	1-1/2"
Air Separators < 28" Diameter	A	1-1/2"
Air Separators > or = 28" Diameter	I	1-1/2"
Boiler Feed Water Storage Tanks < 28" Diameter	A	3" (2 layers)
Boiler Feed Water Storage Tanks < or = 28" Diameter	I	3" (2 layers)
Steam Condensate Receivers < 28" Diameter	A	3" (2 layers)
Steam Condensate Receivers < or = 28" Diameter	I	
Steam Condensate Receivers (Square Tank)	H	
Pipe Anchors / Guides	B	

3.6 MINIMUM DUCT INSULATION SCHEDULE (BASED ON 2012 IECC)

SERVICE	TYPE	THICKNESS
Outdoor Air Ducts	I	2"
Supply Air Ducts	I	2"
Return Air Ducts	I	2"
Diffusers (top/backside)	I	2"
Transfer Ducts	J	1/2"
Supply Ducts Located in Unconditioned Mechanical Room	I	2"
Return Ducts Within 20'-0" of Return Fan	J	1"
Exhaust Ducts Exposed to Outside Air, in Equipment rooms and for 10'-0" Beyond Mechanical Room Walls	I	1-1/2"
Plenums in Mechanical Rooms	H	2"

END OF SECTION

SECTION 23 3100
HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Metal ductwork.

B. Nonmetal ductwork.

1.2 RELATED REQUIREMENTS

A. Section 23 0593 - Testing, Adjusting, and Balancing for HVAC.

B. Section 23 3300 - Air Duct Accessories.

C. Section 23 3700 - Air Outlets and Inlets.

1.3 REFERENCE STANDARDS

A. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2023.

B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2023d.

D. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

E. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2024.

F. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2024.

G. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

H. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; Current Edition, Including All Revisions.

1.4 SUBMITTALS

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

B. Product Data: Provide data for duct materials.

C. Shop Drawings: Submit ductwork shop drawings for entire facility, to scale, double line, indicating duct sizes, locations, elevations, fittings, equipment, accessories, structural clearances, etc. Do not install ductwork prior to approval of shop drawings by Engineer.

1.5 FIELD CONDITIONS

A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 PRODUCTS

2.1 DUCT ASSEMBLIES

A. Regulatory Requirements: Construct ductwork to comply with NFPA 90A, NFPA 90B, and NFPA 96 standards.

B. Ducts: Galvanized steel, unless otherwise indicated.

C. Air ducts shall be constructed as follows:

1. Supply and return duct in Mechanical Rooms: 6 inch w.g.
2. Supply and return duct in shaft: 4 inch w.g.
3. Supply duct upstream of VAV boxes and downstream of shaft: 4 inch w.g.
4. Supply duct downstream of VAV boxes: 2 inch w.g.
5. Constant volume supply duct: 2 inch w.g.
6. Return duct: 2 inch w.g.
7. OA ducts and plenums: 2 inch w.g.
8. Miscellaneous duct (exhaust, transfer grille, etc.): 2 inch w.g.

2.2 MATERIALS

A. Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.

B. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.

1. Duct sealant shall be installed per SMACNA Class A-all transverse joints, longitudinal seams and duct wall penetrations.
2. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
3. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.
4. For Use With Flexible Ducts: UL labeled.
5. Manufacturers:
    a. Carlisle HVAC Products; Hardcast Iron-Grip 601 Water Based Duct Sealant:
    b. Design Polymerics; DP 1010 Water Based Smooth Duct Sealant, Zero VOC, Premium Quality
    c. Ductmate Industries, Inc, a DMI Company

C. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

D. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:

1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.

5. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.
6. Other Types: As required.

2.3 DUCTWORK FABRICATION

A. Fabricate and support in accordance with SMACNA (DCS) and as indicated.

B. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.

C. Construct T's, bends, and elbows with radius of not less than 1.0 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide air foil single thickness turning vanes. Provide trailing edge extension for elbows in series.

D. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.

E. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

F. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA (DCS).

2.4 MANUFACTURED DUCTWORK AND FITTINGS

A. Spiral Ducts: Round spiral lockseam duct with galvanized steel outer wall.
   1. Manufacture in accordance with SMACNA (DCS).
   2. Manufacturers:
      a. United McGill
      b. Semco
      c. EHG, a DMI Company
      d. GSI, a DMI Company
      e. Linx Industries, Inc, a DMI Company
      f. MKT Metal Manufacturing
      g. Norlock

B. Round Ducts: Round lockseam duct with galvanized steel outer wall.
   1. Manufacture in accordance with SMACNA (DCS).
   2. Manufacturers:
      a. United Mcgill
      b. Semco
      c. EHG, a DMI Company
      d. Linx Industries, Inc, a DMI Company
      e. MKT Metal Manufacturing
      f. Norlock

C. Flexible Ducts: UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound spring steel wire.
   1. Pressure Rating: 10 Inches w.g. positive and 1 inch w.g. negative.
   2. Maximum Velocity: 4000 fpm.
   3. Temperature Range: Minus 20 degrees F to 210 degrees F..
   4. Manufacturers:
      a. JP Lamborn Co
      b. Thermaflex
      c. Flexmaster
      d. Hart & Cooley, Inc.

D. Acoustic Flexible Ducts: UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound spring steel wire.
   1. Pressure Rating: 10 inches w.g. positive and 1 inch w.g. negative.
   2. Maximum Velocity: 4000 fpm.
   3. Temperature Range: Minus 20 degree F to 210 degrees F.
   4. Manufacturers:
      a. JP Lamborn Co
      b. Thermaflex
      c. Flexmaster
      d. Substitutions: See Section 01 6000 - Product Requirements.

E. Antimicrobial Flexible Ducts: UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound spring steel wire.
   1. Pressure Rating: 10 inches w.g. positive and 1 inch w.g. negative.
   2. Maximum Velocity: 4000 fpm.
   3. Temperature Range: Minus 20 degrees F to 210 degrees F.

F. Transverse Duct Connection System: SMACNA "E" rated rigidly class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips in accordance with SMACNA (DCS).
   1. Manufacturers:
      a. Carlisle HVAC Products

PART 3 EXECUTION

3.1 INSTALLATION

A. Install, support, and seal ducts in accordance with SMACNA (DCS).

B. Install in accordance with manufacturer's instructions.

C. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

D. Flexible Ducts: Connect to metal ducts with adhesive.

E. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.

F. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

G. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

END OF SECTION

SECTION 23 3300
AIR DUCT ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Backdraft dampers.
2. Volume dampers.
3. Turning vanes.
4. Flexible ducts.

1.2 SUBMITTALS

A. Product Data: For the following:

1. Backdraft dampers.
2. Volume dampers.
3. Turning vanes.
4. Flexible ducts.

B. Shop Drawings:

1. Product Data: Submit manufacturer's technical product data and installation instructions for metal ductwork materials and products.

1.3 QUALITY ASSURANCE

A. Codes and Standards

1. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
2. Ducts, plenums, apparatus casings, metal gauges, reinforcing, methods of supporting and hanging, and other sheet metal work as called for shall meet all functional criteria defined in the SMACNA "HVAC Duct Construction Standards Metal and Flexible" 2005, 3rd Edition. This shall be subsequently referred to as the SMACNA Manual. All ductwork must comply with all local, state and federal code requirements.
3. Comply with applicable requirements of NFPA 91.

PART 2 PRODUCTS

2.1 BACKDRAFT DAMPERS

A. Furnish and install a heavy-duty counterbalanced backdraft damper with steel frame and steel airfoil type 18 gauge steel blades. Blades shall have EPDM seals and jamb seals and be spaced a maximum width of 7" with ¾ inch diameter plated steel axles. The bearings shall be ball bearings pressed into the frame. Damper shall be Ruskin CBS8 or approved equal.

2.2 VOLUME DAMPERS

A. Manual Volume Dampers: Fabricated of same material as ducts, two metal gauges heavier than duct and hemmed 1" all around, mounted on 3/8" square rod with saw slot position indicated. Pivot bearings, elocking position regulator, Young Regulator Co., Series 443.

1. Where positioning regulator is not accessible, provide coupling and extension rod with regulator for ceiling wall or floor installation, as required. Young Series 301 and 315 for ceiling, Series 270-302 for walls.

2.3 TURNING VANES

A. Manufacturers:

1. Aero Dyne; Ductmate; Anemostat; Barber Coleman; Duro Dyne; or Hart & Cooley.

B. Provide single thickness streamline type, except provide turning vanes with trailing edge at elbows which change dimensions or at consecutive elbows.

C. Provide manufactured turning vanes and vane runners, fabricated from the same material as the duct, and constructed in accordance with SMACNA "HVAC Duct Construction Standards". Tab spacing shall be SMACNA standard. Rail systems with non-standard tab spacings shall not be accepted. All tabs shall be used, do not skip tabs. Mounting rails shall have friction insert tabs which align the vanes automatically. Vanes shall be subjected to tensile loading and be capable of supporting 250 lbs. when fastened per the manufacturer's instructions.

2.4 FLEXIBLE DUCTS

A. Manufacturers:

1. Flexible duct shall be by Thermaflex, Semco, Wiremold, or Engineer approved equal.

B. General:

1. Acceptable in supply ductwork only where shown (not allowed in exposed occupied areas). Flexible duct shall include wire, core, insulation, and vapor barrier and the composite assembly shall meet requirements of NFPA-90A and UL181 and shall be UL listed for flame spread rating of not more than 25 and smoke developed rated of not more than 50.

C. Minimum length of flexible duct shall be 3 feet.

D. Maximum length of flexible duct shall be 8 feet.

E. Flexible duct shall have a minimum R-value of 4.2.

F. Flexible duct shall have a maximum vapor transmission rating of .1 perms.

G. Flexible duct shall be rated for operating temperatures between -20 and 250 degrees.

H. All flexible duct shall be connected to metal fittings with stainless steel bands equal to snaplock. The use of duct tape to secure the core is not acceptable.

I. Flexible duct shall have an operating positive pressure rating of 16" wg for nominal sizes 4 thru 10 inch and 10" wg for nominal sizes 12 thru 16 inch, and a negative pressure rating of 2" wg for sizes 4 thru 16 inches. Duct shall be rated for a velocity of 6,000 feet per minute. Duct shall be equal to Thermaflex M-KE.

2.5 QUADRANT LOCKS

A. Provide for each damper, quadrant lock device on one end of shaft; and end bearing plate on other end for damper lengths over 12".

B. Provide extended quadrant locks and end extended bearing plates for externally insulated ductwork.

PART 2 EXECUTION

3.1 APPLICATION AND INSTALLATION

A. Install manual volume dampers in all supply, return and exhaust duct systems as required for controlling air volumes to trunk ducts, branch ducts, outlets and inlets. Contractor shall install a complete system of dampers as required for balancing air systems.

B. Coordinate duct installations with installation of accessories, equipment, controls and other associated work of the ductwork system.

C. Install turning vanes in all square or rectangular 90° elbows in supply, return, and exhaust air systems.

D. Installation of Flexible Ducts: Flexible Ducts are to be installed only where indicated on Drawings.

1. Maximum length of flexible duct is 8'-0" OAL.
2. Minimum length of flexible duct is 3'-0" OAL.
3. Square to round transition gages to comply with SMACNA rectangular duct (minimum 24 ga.).
4. Flexible duct must meet UL 181 and be installed per SMACNA using a clamp for securing duct to collar and a supplemental clamp for securing the insulation and vapor barrier.
5. Support flexible ductwork with minimum 2" wide sheet metal bands, secured to structure with ductwork support materials. Maximum spacing shall be 4 feet on center.
6. The flexible duct shall be installed with a minimum centerline radius equal to 1.5 times the diameter of the duct.
7. When connecting flexible duct to diffusers, the duct shall be installed with a minimum of 6" straight flex at the diffuser.

END OF SECTION

SECTION 23 3416
FANS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. The extent of work is shown on drawings and in schedules and by requirements of this section, and is hereby defined to include, but not by way of limitation:

1. Up-blast axial fans.
2. Ceiling exhaust fans.
3. Fan accessories.
4. Motors and drives.

1.2 CODES AND STANDARDS

A. Installer: A firm with at least 3 years of successful fan installation experience.

B. AMCA Standards: Comply with air movement and control association standards as applicable to testing and rating fans, including but not limited to, AMCA 99, 210, 211, 261, 300, 301. Provide fans that bear the AMCA Certified Ratings Seal for sound and air performance.

C. UL Compliance: Provide fan and components which are UL listed and labeled.

D. SMACNA Standards: Comply with applicable portions of SMACNA duct construction standards.

E. Grease hood exhaust fans shall be UL listed for grease removal (UL762).

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver products with factory-installed shipping skids and lifting lugs; pack components in factory-fabricated protective framing.

B. Handle products carefully to avoid damage to components, enclosures and finish. Do not install damaged components; replace and return damaged components to manufacturer for repairs or replacement.

C. Store products in clean dry place and protect from weather and construction traffic.

1.4 SUBMITTALS

A. Product Data: Product data shall indicate performance data relative to the information scheduled on the drawings. In addition, provide dimensions, weights, capacities, ratings, fan performance, motor electrical characteristics, and gauges and finishes of materials.

B. Provide fan curves with specified operating point clearly plotted.

C. Submit sound power levels for both fan inlet and outlet and radiation at rated capacity.

D. Submit electrical requirements for power supply wiring including wiring diagrams for interlock and control wiring clearly indicating factory installed and field installed wiring.

E. Submit manufacturer’s installation instructions.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

1.6 EXTRA MATERIALS

A. Supply two sets of belts for each belt driven fan.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide products by one of the following, or engineer approved equivalent:

1. Greenheck
2. Penn Barry
3. Trane
4. Cook
5. Twin City Fan
6. Carnes
7. Jenn Fan
8. Aerovent
9. Acme
10. Buffalo Forge, Division of Howden Fan
11. Howden Fan
12. Sun Air
13. Gaylord
14. General Electric

2.2 GENERAL

A. Provide fans of type, sizes, ratings and capacities as indicated on drawings and in schedules.

2.3 CABINET AND CEILING EXHAUST FANS

A. Centrifugal Fan: Direct driven as scheduled, with galvanized steel housing lined with 1/2 inch acoustic insulation, resilient mounted motor, gravity backdraft damper in discharge.

B. Disconnect Switch: Factory wired non-fusible in housing for thermal overload protected motor and wall mounted multiple speed switch.

C. Grille for Ceiling Fan: Molded white plastic grille or aluminum grille with baked white enamel finish.

D. V-belt Drive: Cast iron or steel sheaves, dynamically balanced, bored to fit shafts and keyed, variable and adjustable pitch motor sheave selected so required rpm is obtained with sheaves set at mid-position, fan shaft with self aligning pre-lubricated ball bearings.

PART 3 EXECUTION

3.1 INSPECTION

A. Installer shall examine areas and conditions under which fans are to be installed, and notify Contractor in writing of conditions detrimental to proper completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 INSTALLATION OF FANS

A. Install fans where shown in accordance with equipment manufacturer's written instructions, recognized industry practices, and in accordance with National Electrical Code, to ensure compliance with requirements and serve intended purposes.

B. Coordinate with other work, including ductwork, roof decking, vibration isolation, and electrical work, as necessary to interface installation of fans with other work.

C. Temporary Closure: Upon completion of installation, provide protective covering on fan ductwork connection openings to prevent entrance of dust and debris into equipment.

D. Install vibration isolators and flexible electrical leads to properly isolate the fan vibration from the structure.

E. Provide all direct drive fans with a fan speed controller for balancing.

F. Duct Connections: Provide ductwork, accessories, and flexible connections as indicated.

G. Provide adjustable sheaves required for final air balance.

H. Provide backdraft dampers on discharge of exhaust fans and as indicated.

I. Provide access to adjustable blade axial fan wheels for varying blade angle setting. Adjust blades for varying range of volume and pressure.

J. Provide floor mounted axial fans with reinforced legs. Provide ceiling suspended units with support brackets bolted to casing flange.

K. Do not operate fans in normal operation until ductwork is clean, filters are in place, bearings are lubricated, and fan has been test run under observation.

3.3 ELECTRICAL CONNECTIONS

A. Make sure that the fan is wired properly for proper fan rotation and proper interface with associated thermostat, variable speed controller and outdoor air damper.

B. Provide positive electrical motor grounding.

3.4 TESTING

A. After installation of fans has been completed, test each fan to demonstrate proper operation of unit at performance requirements specified, including, but not limited to, proper rotation of impeller. When possible, field correct malfunctioning units, then retest to demonstrate compliance. Replace units which cannot be satisfactorily corrected at no additional cost to owner.

3.5 MANUFACTURER'S START-UP SERVICES

A. Manufacturer shall furnish a factory trained service engineer without additional charge to start the unit(s).

3.6 WARRANTY

A. Provide a full parts warranty for one year from start-up or 18 months from shipment, whichever occurs first.

END OF SECTION

SECTION 23 3700
AIR OUTLETS AND INLETS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Diffusers:

1. Square and rectangular ceiling diffusers

B. Exhaust and return registers and grilles

1.2 REFERENCE STANDARDS

A. ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Air Inlets; 2023.

1.3 SUBMITTALS

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

B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

C. Project Record Documents: Record actual locations of air outlets and inlets.

1.4 QUALITY ASSURANCE

A. Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.

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

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Diffusers, Registers, and Grilles

1. Anemostat
2. Carnes, a division of Carnes Company Inc
3. Hart & Cooley, Inc
4. Krueger-HVAC
5. Metalaire, a brand of Metal Industries Inc.
6. Nailor
7. Price Industries
8. Raymon-Donco
9. Titus, a brand of Air Distribution Technologies
10. Tuttle and Bailey

2.2 SQUARE AND RECTANGULAR CEILING DIFFUSERS

A. The square plaque diffuser shall be supplied to deliver a 360 degree radial, horizontal air flow pattern. The back cone shall be a one-piece die-formed design with smooth, aerodynamically designed surfaces and no corner joints. This contoured design shall protect the ceiling and help to prevent smudging and streaking. The diffuser shall integrate with all duct sizes shown on the plans without affecting the face size and appearance of the unit. An inner plaque assembly shall be incorporated and shall drop no more than ¼ inch below the ceiling plane to assure proper air distribution performance. The face panel shall have smooth edges and rounded corners to blend with the back cone. The diffuser mounting frame shall be suitable for lay-in or surface mount applications.

B. Type: Provide square, adjustable pattern, stamped, multi-core diffuser to discharge air in four way pattern with sectorizing baffles where indicated.

C. The finish shall be an anodic acrylic paint, baked at 315 degrees F for 30 minutes. The pencil hardness must be HB to H.

D. The manufacturer shall provide published performance data for the diffuser. The diffuser shall be tested in accordance with ANSI/ASHRAE Standard 70-2006.

E. Connections: Round.

F. Fabrication: Aluminum with baked enamel finish.

G. Color: As selected by Architect/Engineer from manufacturer's standard range.

H. Accessories: Opposed blade damper when indicated on the plans and schedules.

2.3 EXHAUST AND RETURN REGISTERS/GRILLES

A. Return grilles shall be of the sizes, capacities, and blade spacing as shown on the plans and schedules. Construction shall be of extruded aluminum with a 1¼-inch wide border on all sides and shall be interlocked at the four corners and mechanically staked to form a rigid frame. Minimum border thickness shall be 0.040 to 0.050 inch. Screw holes shall be countersunk for a neat appearance. Blades shall be contoured to a specifically designed and tested cross-section to meet published performance data. Blades shall be firmly held in place by mullions from behind the grille and fixed in place by crimping or welding. Blade shall have a fixed deflection angle of 45°.

B. Type: Streamlined blades, 1/2 inch maximum spacing, with blades set at 45 degrees, horizontal face.

C. The finish shall be an anodic acrylic paint, baked at 315 degrees F for 30 minutes. The pencil hardness must be HB to H.

D. The manufacturer shall provide published performance data for the grille. The grille shall be tested in accordance with ANSI/ASHRAE Standard 70-2006.

E. Accessories: Opposed blade damper where indicated on the plans and schedules.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Secure louver rigid with concealed fasteners of non-corrosive metals to suit materials as being encountered.

C. Coordinate installation method with application of exterior materials and mechanical work.

D. Set and tie into flashings to ensure diversion of moisture to exterior.

E. Install removable bird screens.

F. Caulk around louvers to form seal with surrounding building materials. Verify proper drainage through weep holes following caulking.

G. Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.

H. Caulk around louvers to form seal with surrounding building materials. Verify proper drainage through weep holes following caulking.

I. Provide transitions as required for connections to ductwork, including square to round.

J. Coordinate wall grilles and registers with thin-line type fire dampers in fire rated walls

K. Install diffusers, registers, and grilles level and plumb.

END OF SECTION

SECTION 23 8239
ELECTRIC UNIT HEATERS

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. Cabinet unit heaters with centrifugal fans and electric-resistance heating coils.
2. Wall and ceiling heaters with propeller fans and electric-resistance heating coils.

1.3 DEFINITIONS

A. PTFE: Polytetrafluoroethylene plastic.

B. TFE: Tetrafluoroethylene plastic.

1.4 ACTION SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for each product indicated.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Location and size of each field connection.
2. Details of anchorages and attachments to structure and to supported equipment.
3. Equipment schedules to include rated capacities, operating characteristics, furnished specialties, and accessories.
4. Wiring Diagrams: Power, signal, and control wiring.

C. Provide color samples for Architect’s selection.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."

PART 2 PRODUCTS

2.1 WALL HEATERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Berko
2. Indeeco
3. Markel
4. QMark
5. Trane

B. Description: An assembly including chassis, electric heating coil, fan, motor, and controls. Comply with UL 2021.

C. Cabinet:

1. Front Panel: Stamped-steel louver or Extruded-aluminum bar grille, with removable panels fastened with tamperproof fasteners.
2. Finish: Baked enamel over baked-on primer with manufacturer's standard color selected by Architect, applied to factory-assembled and -tested wall and ceiling heaters before shipping.
3. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

D. Recessed Cabinet Enclosure: Steel with finish to match cabinet.

E. Electric-Resistance Heating Coil: Nickel-chromium heating wire, free from expansion noise and hum, embedded in magnesium oxide refractory and sealed in corrosion-resistant metallic sheath. Terminate elements in stainless-steel, machine-staked terminals secured with stainless-steel hardware, and limit controls for high temperature protection. Provide integral circuit breaker for overcurrent protection.

F. Fan: Aluminum propeller directly connected to motor.

1. Motor: Permanently lubricated. Comply with requirements in Section 230513 "Common Motor Requirements for HVAC Equipment."

G. Controls: Unit-mounted thermostat.

H. Electrical Connection: Factory wire motors and controls for a single field connection with disconnect switch.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine areas to receive unit heaters for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in for electrical connections to verify actual locations before unit heater installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install wall boxes in finished wall assembly; seal and weatherproof.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing.

B. Perform the following field tests and inspections and prepare test reports:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
2. Operate electric heating elements through each stage to verify proper operation and electrical connections.
3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace malfunctioning units and retest as specified above.

3.4 ADJUSTING

A. Adjust initial temperature set points.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain cabinet unit heaters. Refer to Section 017900 "Demonstration and Training."

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.

B. 26 0529 - Hangers and Supports for Electrical Systems

C. 26 0533.13 - Conduit for Electrical Systems

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. To provide for ease of disconnecting the equipment with minimum interference to other installations.
3. 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.

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.

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. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

D. 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.

E. 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. Cut sleeves to length for mounting flush with both surfaces of walls.

D. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.

E. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable, unless indicated otherwise.

F. 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.

G. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 07 9000 - Joint Sealants.

H. Aboveground, Exterior-Wall Penetrations: Seal penetrations using cast-iron pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for annular clear space between pipe and sleeve for installing mechanical sleeve seals. Base annular clear space on application and manufacturer requirements.

I. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals. Base annular clear space on application and manufacturer requirements.

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

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 REFERENCE STANDARDS

A. NFPA 70E - Standard for Electrical Safety in the Workplace;

1.4 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 field measurements and circuiting arrangements are as indicated.

B. Verify that abandoned wiring and equipment serve only abandoned facilities.

C. Demolition drawings are based on casual field observation.

D. Report discrepancies to Architect/Engineer before disturbing existing installation.

E. 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 5 working days before partially or completely disabling system.
2. Make temporary connections to maintain service in areas adjacent to work area.
3. When work on energized equipment is required provide written documentation of work required, justification for performing work on energized equipment, description of procedures and safety practices, and risk assessment for approval by the Owner. Obtain Owner's written approval prior to performing any work. See NFPA 70E Sample Energized Electrical Work Permit.

E. Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Minimize outage duration.

1. Notify Owner before partially or completely disabling system.
2. Notify local fire service.
3. Make notifications at least 24 hours in advance.

F. Existing Telephone System: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.

1. Notify Owner at least 24 hours before partially or completely disabling system.
2. Notify telephone utility company at least 24 hours before partially or completely disabling system.

3.3 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.

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.

K. Owner may designate and have salvage rights to any material demolished by the Contractor. All material not salvaged by Owner shall be removed and disposed of by Contractor unless noted otherwise.

3.4 CLEANING AND REPAIR

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

B. Clean and repair existing materials and equipment that remain or that are to be reused.

C. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

END OF SECTION

SECTION 26 0519
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Single conductor building wire.

B. Metal-clad cable.

C. Wiring connectors.

D. Electrical tape.

E. Wire pulling lubricant.

F. 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; 2023.

C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010, with Editorial Revision (2020).

D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2020).

E. ASTM B800 - Standard Specification for 8000 Series Aluminum Alloy Wire for Electrical Purposes - Annealed and Intermediate Tempers; 2005 (Reapproved 2021).

F. ASTM B801 - Standard Specification for Concentric-Lay-Stranded Conductors of 8000 Series Aluminum Alloy for Subsequent Covering or Insulation; 2018 (Reapproved 2023).

G. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2017.

H. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

I. NECA 104 - Standard for Installing Aluminum Building Wire and Cable; 2012.

J. NECA 120 - Standard for Installing Armored Cable (AC) and Type Metal-Clad (MC) Cable; 2018.

K. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2021.

L. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

M. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

N. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.

O. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.

P. UL 267 - Outline of Investigation for Wire-Pulling Compounds; Current Edition, Including All Revisions.

Q. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.

R. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.

S. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.

T. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.

U. UL 1569 - Metal-Clad Cables; 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/Engineer of any conflicts with or deviations from 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 conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.

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. Project Record Documents: Record actual installed circuiting arrangements. Record actual routing for underground circuits.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

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

1.7 DELIVERY, STORAGE, AND HANDLING

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

1.8 FIELD CONDITIONS

A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F (-10 degrees C), unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect/Engineer and obtain direction before proceeding with work.

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.

1. Exceptions:

a. Use manufactured wiring systems for branch circuits where concealed above accessible ceilings for lighting.

1) Exception: Provide single conductor building wire in raceway for circuit homerun from distribution box to panelboard.

C. Nonmetallic-sheathed cable is not permitted.

D. Underground feeder and branch-circuit cable is not permitted.

E. Service entrance cable is not permitted.

F. Armored cable is not permitted.

G. Metal-clad cable is permitted only as follows:

1. Where not otherwise restricted, may be used:

a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.

1) Maximum Length: 6 feet (1.8 m).

b. Where concealed in hollow stud walls, above accessible ceilings, and under raised floors for branch circuits up to 20 A.

1) Exception: Provide single conductor building wire in raceway for circuit homerun from first outlet to panelboard.

2. In addition to other applicable restrictions, may not be used:

a. Unless approved by Owner.

b. Where exposed to view, except in dedicated electrical, communications, and mechanical rooms where not subject to damage.

c. Where exposed to damage.

d. For damp, wet, or corrosive locations, unless provided with a PVC jacket listed as suitable for those locations.

H. Manufactured wiring systems are permitted only as follows:

1. Where not otherwise restricted, may be used:

a. For branch circuits where concealed under raised floors and where concealed above accessible ceilings for lighting.

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 except where aluminum conductors are specifically indicated or permitted for substitution. Conductor sizes indicated are based on copper unless specifically indicated as aluminum. Conductors designated with the abbreviation "AL" indicate aluminum.

a. Substitution of aluminum conductors for copper is permitted, when approved by Owner and authority having jurisdiction, only for the following:

1) Services: Copper conductors size 1/0 AWG and larger.
2) Feeders: Copper conductors size 1/0 AWG and larger.

b. Where aluminum conductors are substituted for copper, comply with the following:

1) Size aluminum conductors to provide, when compared to copper sizes indicated, equivalent or greater ampacity and equivalent or less voltage drop.
2) Increase size of raceways, boxes, wiring gutters, enclosures, etc. as required to accommodate aluminum conductors.

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.

4. Aluminum Conductors (only where specifically indicated or permitted for substitution): AA-8000 series aluminum alloy conductors recognized by ASTM B800 and compact stranded in accordance with ASTM B801 unless otherwise indicated.

I. Minimum Conductor Size:

1. Branch Circuits: 12 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. 240/120 V, 1 Phase, 3 Wire System:

1) Phase A: Black.
2) Phase B: Red.
3) Neutral/Grounded: White.

b. Equipment Ground, All Systems: Green.

c. For modifications or additions to existing wiring systems, comply with existing color code when existing code complies with NFPA 70 and is approved by the authority having jurisdiction.

2.3 SINGLE CONDUCTOR BUILDING WIRE

A. Manufacturers:

1. Copper Building Wire:

a. Encore Wire Corporation: www.encorewire.com/#sle.

b. General Cable Technologies Corporation: www.generalcable.com/#sle.

c. Nexans Energy USA

d. The Okonite Company

e. Prysmian Power Cables and Systems: www.us.prysmian.com

f. Southwire Company: www.southwire.com/#sle.

2. Aluminum Building Wire (only where specifically indicated or permitted for substitution):

a. Nexans Energy USA

b. Prysmian Power Cables and Systems: www.us.prysmian.com.

c. Southwire Company: www.southwire.com/#sle.

d. Stabiloy, a brand of General Cable Technologies Corporation: www.stabiloy.com/#sle.

B. Description: Single conductor insulated wire.

C. Conductor Stranding:

1. Feeders and Branch Circuits:

a. Size 10 AWG and Smaller: Solid.

b. Size 8 AWG and Larger: Stranded.

D. Insulation Voltage Rating: 600 V.

E. Insulation:

1. Copper Building Wire: Type THHN/THWN-2, except as indicated below.

2.4 METAL-CLAD CABLE

A. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.

B. Conductor Stranding:

1. Size 10 AWG and Smaller: Solid.
2. Size 8 AWG and Larger: Stranded.

C. Insulation Voltage Rating: 600 V.

D. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.

E. Grounding: Full-size integral equipment grounding conductor.

F. Armor: Steel, interlocked tape.

G. Provide PVC jacket applied over cable armor.

2.5 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.

2.6 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:

1. Listed and labeled as complying with UL 267.
2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
3. Suitable for use at 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. Arrange circuiting to minimize splices.
4. Include circuit lengths required to install connected devices within 10 ft (3.0 m) of location indicated.
5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
6. Maintain separation of wiring for emergency systems in accordance with NFPA 70.

7. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is 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.
8. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.

B. Install products in accordance with manufacturer's instructions.

C. Perform work in accordance with NECA 1 (general workmanship).

D. Install aluminum conductors in accordance with NECA 104.

E. Install metal-clad cable (Type MC) in accordance with NECA 120.

F. 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.

G. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

H. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
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.

I. Terminate cables using suitable fittings.
1. Metal-Clad Cable (Type MC):
    a. Use listed fittings.
    b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.

J. Install conductors with a minimum of 12 inches (300 mm) of slack at each outlet.

K. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

L. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

M. Make wiring connections using specified wiring connectors.

1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
3. Do not remove conductor strands to facilitate insertion into connector.
4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
5. Connections for Aluminum Conductors: Fill connectors with oxide inhibiting compound where not pre-filled by manufacturer.
6. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
7. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

N. 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.

O. Insulate ends of spare conductors using vinyl insulating electrical tape.

P. 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.

Q. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

R. 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 rod electrodes.

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. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; 2022.

D. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.4 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/Engineer of any conflicts with or deviations from 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 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.

C. Project Record Documents: Record actual locations of grounding electrode system components and connections.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

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

1.7 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. Grounding System Resistance:

1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect/Engineer. Precipitation within the previous 48 hours does not constitute normally dry conditions.

2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.

E. Grounding Electrode System:

1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.

a. Provide continuous grounding electrode conductors without splice or joint.

b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.

2. Metal Underground Water Pipe(s):

a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet (3.0 m) at an accessible location not more than 5 feet (1.5 m) from the point of entrance to the building.

b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.

c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.

3. Ground Rod Electrode(s):

a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.

b. Space electrodes not less than 10 feet (3.0 m) from each other and any other ground electrode.

c. Where location is not indicated, locate electrode(s) at least 5 feet (1.5 m) outside building perimeter foundation as near as possible to electrical service entrance; where possible, locate in softscape (uncovered) area.

4. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.

F. Separately Derived System Grounding:

1. Separately derived systems include, but are not limited to:

a. Transformers (except autotransformers such as buck-boost transformers).

2. Provide grounding electrode conductor to connect derived system grounded conductor to nearest effectively grounded metal building frame. Unless otherwise indicated, make connection at neutral (grounded) bus in source enclosure.

3. Provide bonding jumper to connect derived system grounded conductor to nearest metal building frame and nearest metal water piping in the area served by the derived system, where not already used as a grounding electrode for the derived system. Make connection at same location as grounding electrode conductor connection.

4. Provide system bonding jumper to connect system grounded conductor to equipment ground bus. Make connection at same location as grounding electrode conductor connection. Do not make any other connections between neutral (grounded) conductors and ground on load side of separately derived system disconnect.

G. Bonding and Equipment Grounding:

1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.

2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.

3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.

4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.

6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.

7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:

a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.

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.
   a. Exceptions:
      1) Use bare copper conductors where installed underground in direct contact with earth.
      2) Use bare copper conductors where directly encased in concrete (not in raceway).

C. Connectors for Grounding and Bonding:

1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
2. Unless otherwise indicated, use exothermic welded connections or compression connectors for underground, concealed and other inaccessible connections.
   a. Exceptions:
      1) Use mechanical connectors for connections to electrodes at ground access wells.
3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.
   a. Exceptions:
      1) Use exothermic welded connections for connections to metal building frame.

D. Ground Rod Electrodes:

1. Comply with NEMA GR 1.
2. Material: Copper-bonded (copper-clad) steel.
3. Size: 3/4 inch (19 mm) diameter by 10 feet (3.0 m) length, unless otherwise indicated.

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. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.

D. Make grounding and bonding connections using specified connectors.

1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.

2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.

3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.

4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.

5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

E. Identify grounding and bonding system components in accordance with Section 26 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.

C. Perform inspections and tests listed in NETA ATS, Section 7.13.

D. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.

E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

F. 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 03 3000 - Cast-in-Place Concrete: Concrete equipment pads.

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

C. Section 26 0533.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.

D. Section 26 5100 - Interior Lighting: Additional support and attachment requirements for interior luminaires.

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; 2023.

C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2023.

D. MFMA-4 - Metal Framing Standards Publication; 2004.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

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 actual equipment and components to be installed.
2. Coordinate work to provide additional framing and materials required for installation.
3. Coordinate compatibility of support and attachment components with mounting surfaces at installed locations.
4. Coordinate arrangement of supports with ductwork, piping, equipment and other potential conflicts.
5. Notify Architect/Engineer of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install products on or provide attachment to concrete surfaces until concrete has cured; see Section 03 3000.

1.5 QUALITY ASSURANCE

A. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

B. 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.

C. Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

D. 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:

1. Comply with the following. Where requirements differ, comply with most stringent.

a. NFPA 70.

b. Requirements of authorities having jurisdiction.

2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of electrical work.

3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.

4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported with a minimum safety factor of 2.5. Include consideration for vibration, equipment operation, and shock loads where applicable.

5. Do not use products for applications other than as permitted by NFPA 70 and product listing.

6. Steel Components: Use corrosion-resistant materials suitable for environment where installed.

a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.

b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.

c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.

d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Conduit and Cable Supports: Straps and clamps suitable for conduit or cable to be supported.

1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
2. Conduit Clamps: Bolted type unless otherwise indicated.

C. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

D. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.

E. Metal Channel/Strut Framing Systems:

1. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
2. Comply with MFMA-4.
3. Channel/Strut Used as Raceway, Where Indicated: Listed and labeled as complying with UL 5B.
4. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch (2.66 mm).
5. Minimum Channel Dimensions: 1-5/8 inch (41 mm) wide by 13/16 inch (21 mm) high.

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. Anchors and Fasteners:

1. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.
2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
3. Hollow Stud Walls: Use toggle bolts.
4. Steel: Use beam clamps, machine bolts, or welded threaded studs.
5. Sheet Metal: Use sheet metal screws.
6. Wood: Use wood screws.
7. Plastic and lead anchors are not permitted.
8. Powder-actuated fasteners are not permitted.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

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

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

3.2 INSTALLATION

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

B. Install hangers and supports in accordance with NECA 1.

C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

D. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

E. Install support and attachment components for steel conduits in accordance with NECA 101

F. Unless specifically indicated or approved by Architect/Engineer, do not provide support from suspended ceiling support system or ceiling grid.

G. Unless specifically indicated or approved by Architect/Engineer, 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. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

J. Conduit Support and Attachment: See Section 26 0533.13 for additional requirements.

K. Box Support and Attachment: See Section 26 0533.16 for additional requirements.

L. Interior Luminaire Support and Attachment: See Section 26 5100 for additional requirements.

M. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.

N. Secure fasteners in accordance with manufacturer's recommended torque settings.

O. Remove temporary supports.

P. Identify independent electrical component support wires above accessible ceilings, where permitted, with color distinguishable from ceiling support wires in accordance with NFPA 70.

Q. 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. Galvanized steel intermediate metal conduit (IMC).

C. Flexible metal conduit (FMC).

D. Liquidtight flexible metal conduit (LFMC).

E. Galvanized steel electrical metallic tubing (EMT).

F. Rigid polyvinyl chloride (PVC) conduit.

G. High-density polyethylene (HDPE) conduit.

1.2 RELATED REQUIREMENTS

A. Section 26 0526 - Grounding and Bonding for Electrical Systems.

1. Includes additional requirements for fittings for grounding and bonding.

B. Section 26 0529 - Hangers and Supports for Electrical Systems.

C. 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. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2020.

I. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2021.

J. NEMA TC 14 (SERIES) - Reinforced Thermosetting Resin Conduit and Fittings Series; 2015.

K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

L. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.

M. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.

N. UL 360 - Liquid-Tight Flexible Metal Conduit; Current Edition, Including All Revisions.

O. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.

P. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.

Q. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.

R. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.

S. UL 2419 - Outline of Investigation for Electrically Conductive Corrosion Resistant Compounds; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate minimum sizes of conduits with actual type and quantity of conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
2. Coordinate arrangement of conduits with structural members, ductwork, piping, equipment, and other potential conflicts.
3. Verify exact conduit termination locations required for boxes, enclosures, and equipment.
4. Coordinate work to provide roof penetrations that preserve integrity of roofing system and do not void roof warranty.
5. Notify Architect/Engineer of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not begin installation of conductors and cables until installation of conduit between termination points is complete.

1.5 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittals procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.

C. Project Record Documents: Record actual routing for conduits installed underground, conduits embedded within concrete slabs, and conduits 2-inch (53 mm) trade size and larger.

1.6 QUALITY ASSURANCE

A. Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 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, manufacturer's instructions, and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.

C. Underground:

1. Exterior, Direct-Buried: Use rigid PVC conduit or reinforced thermosetting resin conduit (RTRC).
2. Where rigid polyvinyl chloride (PVC) conduit is provided, transition to galvanized steel rigid metal conduit (RMC) or schedule 80 rigid PVC conduit where emerging from underground.
3. Where rigid polyvinyl (PVC) conduit larger than 2-inch (53 mm) trade size is provided, use galvanized steel rigid metal conduit (RMC) elbows for bends.
4. Where galvanized steel rigid metal conduit (RMC) or galvanized steel intermediate metal conduit (IMC) is installed in direct contact with earth where soil has resistivity of less than 2000 ohm-centimeters or is characterized as severely corrosive based on soils report or local experience, use corrosion protection tape, factory-applied corrosion protection coating, or field-applied corrosion protection compound acceptable to authorities having jurisdiction to provide supplementary corrosion protection.

D. Embedded Within Concrete:

1. Within Slab on Grade: Not permitted.
2. Within Slab Above Ground: Not permitted.

E. Concealed Within Hollow Stud Walls: Use galvanized steel electrical metallic tubing (EMT).

F. Concealed Above Accessible Ceilings: Use galvanized steel electrical metallic tubing (EMT).

G. Interior, Damp or Wet Locations: Use galvanized steel intermediate metal conduit (IMC) or galvanized steel electrical metallic tubing (EMT).

H. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel intermediate metal conduit (IMC).

I. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC).

1. Locations subject to physical damage include, but are not limited to:
    a. Where exposed below 8 feet (2.4 m), except within electrical and communication rooms or closets.

J. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit (RMC).

K. Flexible Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit (FMC).

1. Maximum Length: 6 feet (1.8 m).

L. Flexible Connections to Vibrating Equipment:

1. Dry Locations: Use flexible metal conduit (FMC).
2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit (LFMC).
3. Maximum Length: 6 feet (1.8 m) unless otherwise indicated.
4. Vibrating equipment includes, but is not limited to:
    a. Motors.

M. Fished in Existing Walls, Where Necessary: Use flexible metal conduit (FMC).

2.2 CONDUIT - GENERAL REQUIREMENTS

A. Comply with NFPA 70.

B. Existing Work: Where existing conduits are indicated to be reused, they may be reused only where they comply with specified requirements, are free from corrosion, and integrity is verified by pulling mandrel through them.

1. Where permitted, existing conduits to be reused may be used as sole equipment grounding conductor only when continuity of conduit pathway, including associated boxes and fittings, is verified; see Section 26 0526.

C. Fittings for Grounding and Bonding: See Section 26 0526 for additional requirements.

D. Provide conduit, fittings, supports, and accessories required for complete raceway system.

E. Provide products listed, classified, and labeled as suitable for purpose intended.

F. Minimum Conduit Size, Unless Otherwise Indicated:

1. Branch Circuits: 3/4-inch (21 mm) trade size.

2. Branch Circuit Homeruns: 3/4-inch (21 mm) trade size.

G. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.3 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. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.

2. Material: Use steel or malleable iron.

3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.4 GALVANIZED STEEL 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. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 1242.

2. Material: Use steel or malleable iron.

3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, 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.

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 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)

A. Description: NFPA 70, Type EMT galvanized 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 or set-screw 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 acceptable.

2.8 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

B. Fittings:

1. Manufacturer: Same as manufacturer of conduit to be connected.
2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.9 REINFORCED THERMOSETTING RESIN CONDUIT (RTRC)

A. Description: NFPA 70, Type RTRC reinforced thermosetting resin conduit complying with NEMA TC 14 (SERIES).

B. Supports: As recommended by manufacturer.

C. Fittings: Same type and manufacturer as conduit to be connected.

2.10 ACCESSORIES

A. Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil, 0.020 inch (0.51 mm).

B. Conduit Joint Compound: Corrosion-resistant, electrically conductive compound listed as complying with UL 2419; suitable for use with conduit to be installed.

C. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

D. Epoxy Adhesive for RTRC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

E. Pull Strings: Use nylon or polyester tape with average breaking strength of not less than 1,250 lbf (5.6 kN).

F. Sealing Compound for Hazardous/Classified Location Sealing Fittings: Listed for use with particular fittings to be installed.

G. Sealing Systems for Concrete Penetrations:

1. Sleeves: Provide water stop ring or cement coating that bonds to concrete to prevent water infiltration.

2. Rate for minimum of 40 psig; suitable for sealing around conduits to be installed.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive conduits.

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

3.2 INSTALLATION

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

B. Install conduit in accordance with NECA 1.

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 conduits unless specifically indicated to be exposed.

4. Conduits in the following areas may be exposed, unless otherwise indicated:

a. Mechanical equipment rooms.

5. Unless otherwise approved, do not route exposed conduits:

a. Across floors.

b. Across roofs.

c. Across top of parapet walls.

d. Across building exterior surfaces.

6. Arrange conduit to maintain adequate headroom, clearances, and access.
7. Arrange conduit to provide no more than equivalent of four 90-degree bends between pull points.
8. Arrange conduit to provide no more than 150 feet (46 m) between pull points.
9. Route conduits above water and drain piping where possible.
10. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
11. Maintain minimum clearance of 6 inches (150 mm) between conduits and piping for other systems.
12. 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.

    d. Fireplace.

13. Group parallel conduits in same area on common rack.

G. Conduit Support:

1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction; see Section 26 0529.
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 most stringent requirements.

H. Connections and Terminations:

1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
3. Use suitable adapters where required to transition from one type of conduit to another.
4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.

5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
6. Where spare conduits stub up through concrete floors and are not terminated in box or enclosure, provide threaded couplings equipped with threaded plugs set flush with finished floor.
7. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect conductors.
8. Secure joints and connections to provide mechanical strength and electrical continuity.

I. Penetrations:

1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
2. Make penetrations perpendicular to surfaces unless otherwise indicated.
3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
4. Conceal bends for conduit risers emerging above ground.
5. Provide suitable sealing system where conduits penetrate exterior wall below grade.
6. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty.
8. Install firestopping to preserve fire resistance rating of partitions and other elements; see Section 07 8400.

J. Underground Installation:

1. Minimum Cover, Unless Otherwise Indicated or Required:
   a. Underground, Exterior: 18 inches (460 mm).
   b. Under Slab on Grade: 12 inches (300 mm) to bottom of slab.
2. Provide underground warning tape along entire conduit length for service entrance where not concrete-encased; see Section 26 0553.

K. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:

1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
3. Where calculated in accordance with NFPA 70 for reinforced thermosetting resin conduit (RTRC) conduit installed above ground to compensate for thermal expansion and contraction.
4. Where conduits are subject to earth movement by settlement or frost.

L. Conduit Sealing:

1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:

a. Where conduits enter building from outside.

b. Where service conduits enter building from underground distribution system.

c. Where conduits enter building from underground.

d. Where conduits may transport moisture to contact live parts.

2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:

a. Where conduits pass from outdoors into conditioned interior spaces.

b. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

M. Provide pull string in each empty conduit and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches (300 mm) at each end.

N. Provide grounding and bonding; see Section 26 0526.

O. Identify conduits; see Section 26 0553.

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.

1.2 RELATED REQUIREMENTS

A. Section 26 0529 - Hangers and Supports for Electrical Systems.

B. Section 26 0533.13 - Conduit for Electrical Systems:

1. Conduit bodies and other fittings.

C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

D. Section 26 2726 - Wiring Devices:

1. Wall plates.

2. Additional requirements for locating boxes for wiring devices.

E. Section 27 1000 - Structured Cabling: Additional requirements for communications systems outlet boxes.

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 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

D. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

E. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013 (Reaffirmed 2020).

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. 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/Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

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

1.6 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 cast iron boxes or cast aluminum boxes where exposed galvanized steel rigid metal conduit or exposed intermediate metal conduit (IMC) is used.
4. Use raised covers suitable for the type of wall construction and device configuration where required.
5. Use shallow boxes where required by the type of wall construction.
6. Do not use "through-wall" boxes designed for access from both sides of wall.
7. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
8. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
9. 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.
10. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
11. Wall Plates: Comply with Section 26 2726.

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.
   b. Outdoor Locations: Type 3R, painted steel.

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.

F. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.

G. Box Locations:

1. Locate boxes to be accessible. Provide access panels in accordance with Section 08 3100 as required where approved by the Architect.
2. Unless dimensioned, box locations indicated are approximate.
3. Locate boxes as required for devices installed under other sections or by others.
    a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 26 2726.
    b. Communications Systems Outlets: Comply with Section 27 1000.
4. Locate boxes so that wall plates do not span different building finishes.
5. Locate boxes so that wall plates do not cross masonry joints.
6. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
7. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches (150 mm) horizontal separation unless otherwise indicated.
8. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches (610 mm) horizontal separation.
9. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
    a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches (610 mm) separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.
    b. Do not install flush-mounted boxes with area larger than 16 square inches (0.0103 sq m) or such that the total aggregate area of openings exceeds 100 square inches (0.0645 sq m) for any 100 square feet (9.29 sq m) of wall area.
10. Locate junction and pull boxes 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. Install firestopping to preserve fire resistance rating of partitions and other elements.

N. Close unused box openings.

O. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

P. Provide grounding and bonding in accordance with Section 26 0526.

Q. 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. Underground warning tape.

F. Warning signs and labels.

1.2 RELATED REQUIREMENTS

A. Section 09 9123 - Interior Painting.

B. 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.

C. Section 26 2726 - Wiring Devices - Lutron: Device and wallplate finishes; factory pre-marked wallplates.

D. Section 27 1000 - Structured Cabling: Identification for communications cabling and devices.

1.3 REFERENCE STANDARDS

A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs; 2023.

B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2023.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. NFPA 70E - Standard for Electrical Safety in the Workplace; 2024.

E. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

1.4 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. Comply with 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. Identification for Equipment:

1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
    a. Panelboards:
        1) Identify power source and circuit number. Include location.
        2) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
        3) 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.
        3) Identify load(s) served. Include location.
    c. Time Switches:
        1) Identify load(s) served and associated circuits controlled. Include location.
2. Service Equipment:
    a. Use identification nameplate to identify each service disconnecting means.
    b. For buildings or structures supplied by more than one service, or any combination of branch circuits, feeders, and services, use identification nameplate or means of identification acceptable to authority having jurisdiction at each service disconnecting means to identify all other services, feeders, and branch circuits supplying that building or structure. Verify format and descriptions with authority having jurisdiction.
3. Use identification nameplate to identify equipment utilizing series ratings, where permitted, in accordance with NFPA 70.
4. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.
5. Use identification label on inside of door at each fused switch to identify required NEMA fuse class and size.
6. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.
    a. Service equipment.

7. Arc Flash Hazard Warning Labels: Use warning labels to identify arc flash hazards for electrical equipment, such as switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are likely to require examination, adjustment, servicing, or maintenance while energized.
8. Use warning signs to identify electrical hazards for entrances to all rooms and other guarded locations that contain exposed live parts operating at 600 V nominal or less with the word message "DANGER; Electrical hazard; Authorized personnel only" or approved equivalent.
9. Use warning labels to identify electrical hazards for equipment, compartments, and enclosures containing exposed live parts or exposed conductors operating at over 600 V nominal with the word message "DANGER; HIGH VOLTAGE; KEEP OUT".
10. Use warning labels, identification nameplates, or identification labels to identify electrical hazards for equipment where multiple power sources are present with the word message "DANGER; Hazardous voltage; Multiple power sources may be present; Disconnect all electric power including remote disconnects before servicing" or approved equivalent.

B. 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.

C. Identification for Raceways:

1. Use voltage markers, color-coded bands, or factory-painted conduits to identify systems other than normal power system for accessible conduits.
    a. Maximum Intervals: 20 feet (6.1 m).
    b. Color-Coded Bands: Use field-painting or vinyl color coding electrical tape to mark bands 3 inches (76 mm) wide.
        1) Field-Painting: Comply with Section 09 9123 and 09 9113.
        2) Vinyl Color Coding Electrical Tape: Comply with Section 26 0519.
    c. Color Code:
        1) Fire Alarm System: Red.
2. 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.

3. Use identification labels or plastic marker tags to identify spare conduits at each end. Identify purpose and termination location.
4. Use underground warning tape to identify underground raceways.
5. Use voltage markers to identify highest voltage present for wireways at maximum intervals of 20 feet (6.1 m).

D. Identification for Boxes:

1. Use voltage markers to identify highest voltage present.
2. Use voltage markers or color-coded boxes to identify systems other than normal power system.
    a. Color-Coded Boxes: Field-painted in accordance with Section 09 9123 and 09 9113 per the same color code used for raceways.
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".

E. Identification for Devices:

1. Identification for Communications Devices: Comply with Section 27 1000.
2. Wiring Device and Wallplate Finishes: Comply with Section 26 2726.
3. Use identification label to identify fire alarm system devices.
    a. For devices concealed above suspended ceilings, provide additional identification on ceiling tile below device location.
4. Use identification label or engraved wallplate to identify serving branch circuit for all receptacles.
    a. For receptacles in public areas or in areas as directed by Architect, provide identification on inside surface of wallplate.
5. Use identification label or engraved wallplate to identify load controlled for wall-mounted control devices controlling loads that are not visible from the control location and for multiple wall-mounted control devices installed at one location.
6. Use identification label to identify receptacles protected by upstream GFI protection, where permitted.

F. Identification for Luminaires:

1. Use permanent red dot on luminaire frame to identify luminaires connected to emergency power system.

2.2 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:

1. Materials:
    a. Indoor Clean, Dry Locations: Use plastic nameplates.
    b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.

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.

D. Format for General Information and Operating Instructions:
1. Minimum Size: 1 inch (25 mm) by 2.5 inches (64 mm).
2. Legend: Include information or instructions indicated or as required for proper and safe operation and maintenance.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 1/4 inch (6 mm).
5. Color: Black text on white background unless otherwise indicated.

E. Format for Receptacle Identification:
1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).
2. Legend: Power source and circuit number or other designation indicated.
    a. Include voltage and phase for other than 120 V, single phase circuits.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch (5 mm).
5. Color: Black text on clear background.

F. Format for Fire Alarm Device Identification:

1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).
2. Legend: Designation indicated and device zone or address.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch (5 mm).
5. Color: Red text on white background.

2.3 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.

2.5 UNDERGROUND WARNING TAPE

A. Materials: Use foil-backed detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.

B. Foil-backed Detectable Type Tape: 6 inches (152 mm) wide, with minimum thickness of 5 mil (0.1 mm), unless otherwise required for proper detection.

C. Legend: Type of service, continuously repeated over full length of tape.

D. Color:

1. Tape for Buried Power Lines: Black text on red background.

2.6 WARNING SIGNS AND LABELS

A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

B. Warning Signs:

1. Materials:

a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.

b. Outdoor Locations: Use factory pre-printed rigid aluminum signs.

2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.

3. Minimum Size: 7 by 10 inches (178 by 254 mm) unless otherwise indicated.

C. Warning Labels:

1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.

a. Do not use labels designed to be completed using handwritten text.

b. Provide polyester overlaminate to protect handwritten text.

2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.

3. Minimum Size: 2 by 4 inches (51 mm by 102 mm) unless otherwise indicated.

PART 3 EXECUTION

3.1 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:

1. Surface-Mounted Equipment: Enclosure front.

2. Flush-Mounted Equipment: Inside of equipment door.

3. Elevated Equipment: Legible from the floor or working platform.

4. Branch Devices: Adjacent to device.

5. Interior Components: Legible from the point of access.

6. Conduits: Legible from the floor.

7. Boxes: Outside face of cover.

8. Conductors and Cables: Legible from the point of access.

9. Devices: Outside face of cover.

C. Install identification products centered, level, and parallel with lines of item being identified.

D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.

E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.

F. Install underground warning tape above buried lines with one tape per trench at 3 inches (75 mm) below finished grade.

G. Secure rigid signs using stainless steel screws.

H. Mark all handwritten text, where permitted, to be neat and legible.

3.3 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 0583
WIRING CONNECTIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrical connections to equipment.

1.2 RELATED REQUIREMENTS

A. Section 26 0519 - Low-Voltage Electrical Power Conductors and Cables.

B. Section 26 0533.13 - Conduit for Electrical Systems.

C. Section 26 0533.16 - Boxes for Electrical Systems.

D. Section 26 2726 - Wiring Devices.

E. Section 26 2816.16 - Enclosed Switches.

1.3 REFERENCE STANDARDS

A. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).

B. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2021.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.

2. Determine connection locations and requirements.

B. Sequencing:

1. Install rough-in of electrical connections before installation of equipment is required.

2. Make electrical connections before required start-up of equipment.

PART 2 PRODUCTS

2.1 MATERIALS

A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.

1. Colors: Comply with NEMA WD 1.

2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.

3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

B. Disconnect Switches: As specified in Section 26 2816.16 and in individual equipment sections.

C. Wiring Devices: As specified in Section 26 2726.

D. Flexible Conduit: As specified in Section 26 0533.13.

E. Wire and Cable: As specified in Section 26 0519.

F. Boxes: As specified in Section 26 0533.16.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.2 ELECTRICAL CONNECTIONS

A. Make electrical connections in accordance with equipment manufacturer's instructions.

B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.

C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.

D. Provide receptacle outlet to accommodate connection with attachment plug.

E. Provide cord and cap where field-supplied attachment plug is required.

F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.

H. Install terminal block jumpers to complete equipment wiring requirements.

I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

END OF SECTION

SECTION 26 0923
LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Occupancy sensors.

B. In-wall time switches.

C. In-wall interval timers.

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 0533.16 - Boxes for Electrical Systems.

D. Section 26 2726 - Wiring Devices: Devices for manual control of lighting, including wall switches and wall dimmers.

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 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2023.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. UL 916 - Energy Management Equipment; Current Edition, Including All Revisions.

F. UL 917 - Clock-Operated Switches; Current Edition, Including All Revisions.

G. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of lighting control devices with millwork, furniture, equipment, etc. installed under other sections or by others.

2. Coordinate the placement of wall switch occupancy sensors with actual installed door swings.

3. Coordinate the placement of occupancy sensors with millwork, furniture, equipment or other potential obstructions to motion detection coverage installed under other sections or by others.

4. Coordinate the placement of photo sensors for daylighting controls with windows, skylights, and luminaires to achieve optimum operation. Coordinate placement with ductwork, piping, equipment, or other potential obstructions to light level measurement installed under other sections or by others.

5. Notify Architect/Engineer of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

B. Pre-Wire Meeting: Where Lighting Control Manufacturer Sensor Layout and Tuning service is specified in Part 2 under "LIGHTING CONTROLS - GENERAL REQUIREMENTS", sensor locations to be reviewed in accordance with layout provided by Lighting Control Manufacturer. Lighting Control Manufacturer may direct Contractor regarding sensor relocation should conditions require a deviation from locations indicated.

C. Sequencing:

1. Do not install lighting control 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: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.

1. Occupancy Sensors: Include detailed motion detection coverage range diagrams.

C. Shop Drawings:

1. Occupancy Sensors: Provide lighting plan indicating location, model number, and orientation of each occupancy sensor and associated system component.
2. Provide detailed wiring diagrams for each sequence of operation scheme used in the plans.

D. Field Quality Control Reports.

E. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

F. Operation and Maintenance Data: Include detailed information on device programming and setup.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 6000 - Product Requirements, for additional provisions.

H. Project Record Documents: Record actual installed locations and settings for lighting control devices.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

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

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

1.7 DELIVERY, STORAGE, AND PROTECTION

A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions 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 occupancy sensors.

PART 2 PRODUCTS

2.1 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.

C. Products for Switching of Electronic Ballasts/Drivers: Tested and rated to be suitable for peak inrush currents specified in NEMA 410.

2.2 OCCUPANCY SENSORS

A. All Occupancy Sensors:

1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
2. Sensor Technology:
    a. Passive Infrared (PIR) Occupancy Sensors: Designed to detect occupancy by sensing movement of thermal energy between zones.
    b. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and ultrasonic technologies.
3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during an adjustable turn-off delay time interval.
5. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.
6. Passive Infrared Lens Field of View: Field customizable by addition of factory masking material, adjustment of integral blinders, or similar means to block motion detection in selected areas.
7. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.
8. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, LED lighting, and fractional motor loads, with no minimum load requirements.

9. Load Rating for Line Voltage Occupancy Sensors: As required to control the load indicated on drawings.

B. Wall Switch Occupancy Sensors:

1. All Wall Switch Occupancy Sensors:

a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.

b. Where indicated, provide two-circuit units for control of two separate lighting loads, with separate manual controls and separately programmable operation for each load.

c. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).

d. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.

e. Finish: Match finishes specified for wiring devices in Section 26 2726, unless otherwise indicated.

C. Wall Dimmer Occupancy Sensors:

1. General Requirements:

a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated dimming control capability, and no leakage current to load in off mode.

b. Dimmer: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, and listed as complying with UL 1472; type and rating suitable for load controlled.

2.3 IN-WALL TIME SWITCHES

2.4 IN-WALL INTERVAL TIMERS

A. Digital Electronic In-Wall Interval Timers:

1. Description: Factory-assembled solid state programmable controller with LCD display, suitable for mounting in standard wall box, and listed and labeled as complying with UL 916 or UL 917.

2. Program Capability: Designed to turn load off at end of preset time interval.

3. Time Interval: Field selectable range of presets available up to 12 hours.

4. Provide field selectable audible and visual indication to warn that end of interval operation is about to turn off load.

5. Provide power outage backup to retain programming and maintain clock.

6. Manual override: Capable of both turning load off and resetting timer to original preset time interval.

7. Switch Configuration: Suitable for use in either SPST or 3-way application.

8. Contact Ratings: As required to control the load indicated on drawings.

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 devices and conductors in accordance with NFPA 70.

C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.

F. Verify that the service voltage and ratings of lighting control devices are appropriate for the service voltage and load requirements at the location to be installed.

G. 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. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of lighting control devices provided under this section.

C. Install lighting control devices in accordance with manufacturer's instructions.

D. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

E. Install lighting control devices plumb and level, and held securely in place.

F. Where required and not furnished with lighting control device, provide wall plate in accordance with Section 26 2726.

G. Provide required supports in accordance with Section 26 0529.

H. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

I. Identify lighting control devices in accordance with Section 26 0553.

J. Occupancy Sensor Locations:

1. Location Adjustments: Do not make adjustments to locations without obtaining approval from the Architect/Engineer.

2. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors a minimum of 6 feet (1.8 m) from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.

3.4 FIELD QUALITY CONTROL

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

B. Inspect each lighting control device for damage and defects.

C. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area. Record test results in written report to be included with submittals.

D. Test time switches to verify proper operation.

E. Correct wiring deficiencies and replace damaged or defective lighting control devices.

3.5 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by Architect/Engineer.

C. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.

D. Adjust time switch settings to achieve desired operation schedule as indicated or as directed by Architect/Engineer. Record settings in written report to be included with submittals.

3.6 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.7 CLOSEOUT ACTIVITIES

A. See Section 01 7800 - Closeout Submittals, for closeout submittals.

B. Demonstration: Demonstrate proper operation of lighting control devices to Architect/Engineer, and correct deficiencies or make adjustments as directed.

C. Training: Train Owner's personnel on operation, adjustment, programming, and maintenance of lighting control devices.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
2. Provide minimum of two hours of training.
3. Instructor: Qualified contractor familiar with the project and with sufficient knowledge of the installed lighting control devices.
4. Location: At project site.

END OF SECTION

SECTION 26 2100
LOW-VOLTAGE ELECTRICAL SERVICE ENTRANCE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrical service requirements.

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 2416 - Panelboards: Service entrance equipment.

1.3 PRICE AND PAYMENT PROCEDURES

1.4 DEFINITIONS

A. Service Point: The point of connection between the facilities of the serving utility and the premises wiring as defined in NFPA 70, and as designated by the Utility Company.

1.5 REFERENCE STANDARDS

A. IEEE C2 - National Electrical Safety Code(R) (NESC(R)); 2023.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.6 ADMINISTRATIVE REQUIREMENTS

A. No later than two weeks following date of the Agreement, notify Utility Company of anticipated date of service.

B. Coordination:

1. Verify the following with Utility Company representative:
    a. Utility Company requirements, including division of responsibility.
    b. Exact location and details of utility point of connection.
    c. Utility easement requirements.
    d. Utility Company charges associated with providing service.
2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for electrical service and associated equipment.
3. Coordinate arrangement of service entrance equipment with the dimensions and clearance requirements of the actual equipment to be installed.
4. Notify Architect/Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

C. Arrange for Utility Company to provide permanent electrical service. Prepare and submit documentation required by Utility Company.

D. Utility Company charges associated with providing permanent service to be paid by Contractor.

E. Preinstallation Meeting: Convene one week prior to commencing work of this section to review service requirements and details with Utility Company representative.

F. Scheduling:

1. Where work of this section involves interruption of existing electrical service, arrange service interruption with Owner.

2. Arrange for inspections necessary to obtain Utility Company approval of installation.

1.7 QUALITY ASSURANCE

A. Comply with the following:

1. IEEE C2 (National Electrical Safety Code).

2. NFPA 70 (National Electrical Code).

3. The requirements of the Utility Company.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Products: Listed, classified, and labeled as suitable for the purpose intended.

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

1.8 DELIVERY, STORAGE, AND HANDLING

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

B. Store products indoors in a clean, dry space having a uniform temperature to prevent condensation (including outdoor rated products which are not weatherproof until completely and properly installed). 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 products carefully to avoid damage to internal components, enclosure, and finish.

PART 2 PRODUCTS

2.1 ELECTRICAL SERVICE REQUIREMENTS

A. Provide new electrical service consisting of all required conduits, conductors, equipment, metering provisions, supports, accessories, etc. as necessary for connection between Utility Company point of supply and service entrance equipment.

B. Electrical Service Characteristics: As indicated on drawings.

C. Utility Company: As indicated on drawings.

D. Division of Responsibility:

1. Pad-Mounted Utility Transformers:

a. Transformer Pads: Existing to Remain.

b. Transformers: Furnished and installed by Utility Company.

c. Transformer Grounding Provisions: Existing to Remain.

d. Secondary:

1) Trenching and Backfilling: Provided by Contractor.
2) Conduits: Furnished and installed by Contractor.
3) Conductors: Furnished and installed by Contractor (Service Point at transformer).

2. Terminations at Service Point: Provided by Utility Company.

3. Metering Provisions:

a. Meter Bases: Furnished and installed by Contractor per Utility Company requirements.

b. Metering Transformer Cabinets: Furnished and installed by Contractor per Utility Company requirements.

c. Metering Transformers: Furnished and installed by Utility Company.

d. Conduits Between Metering Transformers and Meters: Furnished and installed by Contractor per Utility Company requirements.

e. Wiring Between Metering Transformers and Meters: Furnished and installed by Utility Company.

f. Communications Conduits for Meters: Furnished and installed by Contractor per Utility Company requirements.

E. Products Furnished by Contractor: Comply with Utility Company requirements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that ratings and configurations of service entrance equipment are consistent with the indicated requirements.

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

3.2 PREPARATION

A. Verify and mark locations of existing underground utilities.

3.3 INSTALLATION

A. Install products in accordance with manufacturer's instructions and Utility Company requirements.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances and required maintenance access.

D. Provide required support and attachment components in accordance with Section 26 0529.

E. Provide grounding and bonding for service entrance equipment in accordance with Section 26 0526.

F. Identify service entrance equipment, including main service disconnect(s) in accordance with Section 26 0553.

3.4 PROTECTION

A. Protect installed equipment from subsequent construction operations.

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.

1.3 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendments (2022).

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2015.

D. NEMA 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 1000 Volts or Less; 2023.

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.

M. UL 943 - Ground-Fault Circuit-Interrupters; 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/Engineer of any conflicts with or deviations from 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 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. Comply with 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: www.geindustrial.com/#sle.

B. Eaton Corporation: www.eaton.com/#sle.

C. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.

D. Siemens Industry, Inc: www.usa.siemens.com/#sle.

E. Source Limitations: Provide panelboards and associated components produced by same manufacturer as other electrical distribution equipment used for project and obtained from a single supplier.

2.2 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:

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 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.

b. Outdoor Locations: Type 3R.

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.

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 flush-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.

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.
    a. Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes for all circuit breakers serving dry type distribution transformers where not served by breakers with solid state trip units.
5. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
6. Provide the following circuit breaker types where indicated:
    a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
7. Provide listed switching duty rated circuit breakers with SWD marking for all lighting circuits.
8. Do not use tandem circuit breakers.
9. 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 support and attachment in accordance with Section 26 0529.

F. Install panelboards plumb.

G. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.

H. 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.

I. Provide minimum of six spare 1 inch (27 mm) trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.

J. Provide grounding and bonding in accordance with Section 26 0526.

K. Install all field-installed branch devices, components, and accessories.

L. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

M. Set field-adjustable ground fault protection pickup and time delay settings as indicated.

N. Provide filler plates to cover unused spaces in panelboards.

O. 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.

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. Test GFCI circuit breakers to verify proper operation.

E. 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

SECTION 26 2726
WIRING DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wall switches.

B. Receptacles.

C. Wall plates and covers.

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 (Validated 2022).

B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush Mounted (General Specification); 2017g (Validated 2023).

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

D. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

E. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).

F. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2021.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.

I. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.

J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.

K. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

L. UL 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/Engineer of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

B. Sequencing:

1. Do not install wiring devices until final surface finishes and painting are complete.

1.5 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.

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. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

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

D. Products: Listed, classified, and labeled as suitable for the purpose intended.

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

1.7 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 DEVICES - GENERAL REQUIREMENTS

A. Provide wiring devices suitable for intended use with ratings adequate for load served.

2.2 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 20 and where applicable FS W-S-896; types as indicated on the drawings.

1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

C. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

2.3 RECEPTACLES

A. Manufacturers:

1. Hubbell Incorporated: www.hubbell.com/#sle.
2. Cooper Wiring Devices.
3. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.
4. Lutron Electronics Company, Inc: www.lutron.com/sle.
5. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.

B. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.

1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
2. NEMA configurations specified are according to NEMA WD 6.

C. Convenience Receptacles:

1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
2. Tamper Resistant and Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.

D. GFCI Receptacles:

1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
    a. Provide test and reset buttons of same color as device.
2. Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.

3. Tamper Resistant and Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations.

2.4 WALL PLATES AND COVERS

A. Manufacturers:

1. Hubbell Incorporated: www.hubbell-wiring.com/#sle.
2. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.
3. Lutron Electronics Company, Inc: www.lutron.com/sle.
4. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.
5. 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.

F. Weatherproof Covers for Wet or Damp Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

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) to center of device.

b. Wall Dimmers: 48 inches (1200 mm) to center of device.

c. Receptacles: 18 inches (450 mm) above finished floor to center of device or 8 inches (200 mm) above counter to center of device.

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/Engineer 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 2813
FUSES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fuses.

1.2 RELATED REQUIREMENTS

A. Section 26 2816.16 - Enclosed Switches: Fusible switches.

1.3 REFERENCE STANDARDS

A. NEMA FU 1 - Low Voltage Cartridge Fuses; 2012.

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. UL 248-1 - Low-Voltage Fuses - Part 1: General Requirements; Current Edition, Including All Revisions.

D. UL 248-4 - Low-Voltage Fuses - Part 4: Class CC Fuses; Current Edition, Including All Revisions.

E. UL 248-12 - Low-Voltage Fuses - Part 12: Class R Fuses; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate fuse clips furnished in equipment provided under other sections for compatibility with indicated fuses.
2. Coordinate fuse requirements according to manufacturer's recommendations and nameplate data for actual equipment to be installed.
3. Notify Architect/Engineer of any conflicts with or deviations from 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 data sheets including voltage and current ratings, interrupting ratings, time-current curves, and current limitation curves.

C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Section 01 6000 - Product Requirements, for additional provisions.
2. Extra Fuses: One set(s) of three for each type and size installed.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

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

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

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Bussmann, a division of Eaton Corporation: www.cooperindustries.com.

B. Littelfuse, Inc: www.littelfuse.com.

C. Mersen: ep-us.mersen.com.

2.2 APPLICATIONS

A. Individual Motor Branch Circuits: Class RK5, time-delay.

B. Primary Protection for Control Transformers: Class CC, time-delay.

2.3 FUSES

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.

C. Provide fuses of the same type, rating, and manufacturer within the same switch.

D. Comply with UL 248-1.

E. Unless otherwise indicated, provide cartridge type fuses complying with NEMA FU 1, Class and ratings as indicated.

F. Voltage Rating: Suitable for circuit voltage.

G. Class R Fuses: Comply with UL 248-12.

1. Class RK5, Time-Delay Fuses:

H. Class CC Fuses: Comply with UL 248-4.

1. Class CC, Time-Delay Fuses:

I. Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.

J. Provide the following accessories where indicated or where required to complete installation:

1. Fuseholders: Compatible with indicated fuses.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that fuse ratings are consistent with circuit voltage and manufacturer's recommendations and nameplate data for equipment.

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

3.2 INSTALLATION

A. Do not install fuses until circuits are ready to be energized.

B. Install fuses with label oriented such that manufacturer, type, and size are easily read.

END OF SECTION

SECTION 26 2816.16
ENCLOSED SWITCHES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Enclosed safety switches.

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 2813 - Fuses.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

C. NEMA KS 1 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.

D. NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

G. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

H. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.

2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.

3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.

4. Notify Architect/Engineer of any conflicts with or deviations from 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 enclosed switches and other installed components and accessories.

C. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

1. Include dimensioned plan and elevation views of enclosed switches and adjacent equipment with all required clearances indicated.

2. Include wiring diagrams showing all factory and field connections.

D. Field Quality Control Test Reports.

E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

F. Project Record Documents: Record actual locations of enclosed switches.

G. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

H. 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. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

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

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

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

1.8 FIELD CONDITIONS

A. Maintain ambient temperature between -22 degrees F (-30 degrees C) and 104 degrees F (40 degrees C) during and after installation of enclosed switches.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Eaton Corporation: www.eaton.com.

B. Schneider Electric; Square D Products: www.schneider-electric.us.

C. Siemens Industry, Inc: www.usa.siemens.com.

D. Source Limitations: Provide enclosed switches and associated components produced by same manufacturer as other electrical distribution equipment used for project and obtained from single supplier.

2.2 ENCLOSED SAFETY SWITCHES

A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:

1. Altitude: Less than 6,600 feet (2,000 m).

2. Ambient Temperature: Between -22 degrees F (-30 degrees C) and 104 degrees F (40 degrees C).

D. Horsepower Rating: Suitable for connected load.

E. Voltage Rating: Suitable for circuit voltage.

F. Short Circuit Current Rating:

1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as determined by short circuit study performed in accordance with Section 26 0573.

G. Provide with switch blade contact position that is visible when the cover is open.

H. Fuse Clips for Fusible Switches: As required to accept fuses indicated.

1. Where NEMA Class R fuses are installed, provide rejection feature to prevent installation of fuses other than Class R.

I. Conductor Terminations: Suitable for use with the conductors to be installed.

J. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.

K. 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.

b. Outdoor Locations: Type 3R.

L. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

M. Heavy Duty Switches:

1. Comply with NEMA KS 1.

2. Conductor Terminations:

a. Provide mechanical lugs unless otherwise indicated.

b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.
    a. Provide means for locking handle in the ON position.

N. Provide the following features and accessories where indicated or where required to complete installation:
1. Hubs: As required for environment type; sized to accept conduits to be installed.
2. Auxiliary Switch: SPDT switch suitable for connection to system indicated, with auxiliary contact operation before switch blades open and after switch blades close.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive enclosed safety switches.

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

3.2 INSTALLATION

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

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required support and attachment in accordance with Section 26 0529.

E. Install enclosed switches plumb.

F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches (2000 mm) above the floor or working platform.

G. Provide grounding and bonding in accordance with Section 26 0526.

H. Provide fuses complying with Section 26 2813 for fusible switches as indicated or as required by equipment manufacturer's recommendations.

I. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.

J. Identify enclosed switches 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.

C. Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.

D. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

3.4 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.5 CLEANING

A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

SECTION 26 5100
INTERIOR LIGHTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Interior luminaires.

B. Exit signs.

C. Ballasts and drivers.

D. Lamps.

1.2 RELATED REQUIREMENTS

A. Section 26 0529 - Hangers and Supports for Electrical Systems.

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.

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; 2023.

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; 2023.

J. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2023.

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.

4. Notify Architect/Engineer of any conflicts or deviations from 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. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

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

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

1.7 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 3-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 EXIT SIGNS

A. Description: Exit signs complying with NFPA 101 and applicable state and local codes, and listed and labeled as complying with UL 924.

1. Number of Faces: Single- or double-face as indicated or as required for installed location.
2. Directional Arrows: As indicated or as required for installed location.

2.4 BALLASTS AND DRIVERS

A. Ballasts/Drivers - General Requirements:

1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.
3. Electronic Ballasts/Drivers: Inrush currents not exceeding peak currents specified in NEMA 410.
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.
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.
   a. Wall Dimmers: See Section 26 2726.
   b. Daylighting Controls: See Section 26 0923.
   c. Network Lighting Controls: See Section 26 0943 - Network Lighting Controls - Lutron QS/Quantum.
   d. Network Lighting Controls: See Section 26 0943 - Network Lighting Controls - Lutron Homeworks.

2.5 LAMPS

A. Lamps - General Requirements:

1. Unless explicitly excluded, provide new, compatible, operable lamps in each luminaire.
2. Verify compatibility of specified lamps with luminaires to be installed. Where lamps are not specified, provide lamps per luminaire manufacturer's recommendations.
3. Minimum Efficiency: Provide lamps complying with all current applicable federal and state lamp efficiency standards.
4. Color Temperature Consistency: Unless otherwise indicated, for each type of lamp furnish products which are consistent in perceived color temperature. Replace lamps that are determined by the Architect/Engineer to be inconsistent in perceived color temperature.

2.6 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. Provide required support and attachment in accordance with Section 26 0529.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Suspended Ceiling Mounted Luminaires:

1. Do not use ceiling tiles to bear weight of luminaires.
2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
3. Secure surface-mounted and pendant-mounted luminaires to building structure.
4. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
5. In addition to ceiling support wires, provide two galvanized steel safety wire(s), minimum 12 gauge, connected from opposing corners of each recessed luminaire to building structure.
6. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.

G. 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.

H. 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.

I. Install accessories furnished with each luminaire.

J. Bond products and metal accessories to branch circuit equipment grounding conductor.

K. Fluorescent Luminaires Controlled by Dual-Level Switching: Connect such that each switch controls the same corresponding lamps in each luminaire.

L. Exit Signs:

1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

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/Engineer.

3.5 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect/Engineer. 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/Engineer 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. 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

SECTION 27 1000
STRUCTURED CABLING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Copper cable and terminations.

B. Communications outlets.

C. Communications identification.

1.2 RELATED REQUIREMENTS

A. Section 26 0526 - Grounding and Bonding for Electrical Systems.

B. Section 26 0533.16 - Boxes for Electrical Systems.

C. Section 26 0553 - Identification for Electrical Systems: Identification products.

D. Section 26 2726 - Wiring Devices.

1.3 REFERENCE STANDARDS

A. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition; 2019.

B. EIA/ECA-310 - Cabinets, Racks, Panels, and Associated Equipment; 2005e.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. TIA-492CAAB - Detail Specification for Class IVa Dispersion-Unshifted Single-Mode Optical Fibers with Low Water Peak; 2000 (Reaffirmed 2005).

E. TIA-526-14 - Optical Power Loss Measurement of Installed Multimode Fiber Cable Plant; IEC 61280-4.1 Edition 3.1, Fiber Optic Communications Subsystem Test Procedures- Part 4-1: Installed Cable Plant- Multimode Attenuation Measurement; 2023d.

F. TIA-568 (SET) - Commercial Building Telecommunications Cabling Standard Set; 2020.

G. TIA-568.2 - Balanced Twisted-Pair Telecommunications Cabling and Components Standards; 2018d, with Addenda (2020).

H. TIA-569 - Telecommunications Pathways and Spaces; 2019e, with Addendum (2022).

I. TIA-606 - Administration Standard for Telecommunications Infrastructure; 2021d.

J. TIA-607 - Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises; 2019d, with Addendum (2021).

K. UL 444 - Communications Cables; Current Edition, Including All Revisions.

L. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.

M. UL 1863 - Communications-Circuit Accessories; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate requirements for service entrance and entrance facilities with Communications Service Provider.
2. Coordinate the work with other trades to avoid placement of other utilities or obstructions within the spaces dedicated for communications equipment.
3. Coordinate arrangement of communications equipment with the dimensions and clearance requirements of the actual equipment to be installed.
4. Notify Architect/Engineer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Preinstallation Meeting: Convene one week prior to commencing work of this section to review service requirements and details with Communications Service Provider representative.

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 each product.

C. Shop Drawings: Show compliance with requirements on isometric schematic diagram of network layout, showing cable routings, telecommunication closets, rack and enclosure layouts and locations, service entrance, and grounding, prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).

D. Evidence of qualifications for installer.

E. Test Plan: Complete and detailed plan, with list of test equipment, procedures for inspection and testing, and intended test date; submit at least 60 days prior to intended test date.

F. Field Test Reports.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: At least 3 years' experience manufacturing products of the type specified.

B. Installer Qualifications: A company having at least 3 years' experience in the installation and testing of the type of system specified, and:

1. Employing a BICSI Registered Communications Distribution Designer (RCDD).
2. Supervisors and installers factory certified by manufacturers of products to be installed.
3. Employing BICSI Registered Cabling Installation Technicians (RCIT) for supervision of all work.
4. Certified by manufacture for installation of system and provide their extended warranty.

C. Products: Listed, classified, and labeled as suitable for the purpose intended.

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 HANDLING

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

B. Keep stored products clean and dry.

1.8 WARRANTY

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

B. Correct defective Work within a 2 year period after Date of Substantial Completion.

C. Provide manufacture 25 year system warranty.

PART 2 PRODUCTS

2.1 SYSTEM DESIGN

A. Provide a complete permanent system of cabling and pathways for voice and data communications, including cables, conduits and wireways, pull wires, support structures, enclosures and cabinets, and outlets.

1. Comply with TIA-568 (SET) (cabling) and TIA-569 (pathways) (commercial standards).
2. Provide fixed cables and pathways that comply with NFPA 70 and TIA-607 and are UL listed or third party independent testing laboratory certified.
3. Provide connection devices that are rated for operation under conditions of 32 to 140 degrees F (0 to 60 degrees C) at relative humidity of 0 to 95 percent, noncondensing.
4. In this project, the term plenum is defined as return air spaces above ceilings, inside ducts, under raised floors, and other air-handling spaces.

B. Main Distribution Frame (MDF): Centrally located support structure for terminating horizontal cables that extend to telecommunications outlets, functioning as point of presence to external service provider.

1. Locate main distribution frame as indicated on the drawings.
2. Capacity: As required to terminate all cables required by design criteria plus minimum 25 percent spare space.

C. Cabling to Outlets: Specified horizontal cabling, wired in star topology to distribution frame located at center hub of star; also referred to as "links".

2.2 PATHWAYS

A. Conduit: As specified in Section 26 0534 provide pull cords in all conduit.

2.3 COPPER CABLE AND TERMINATIONS

A. Provide cables with lead content less than 300 parts per million.

B. Copper Horizontal Cable:

1. Description: 100 ohm, balanced twisted pair cable complying with TIA-568.2 and listed and labeled as complying with UL 444.
2. Cable Type - Voice and Data: TIA-568-C.2 Category 6 UTP (unshielded twisted pair); 23 AWG.
3. Cable Capacity: 4-pair.
4. Cable Applications: Use listed NFPA 70 Type CMP plenum cable unless otherwise indicated.

5. Cable Jacket Color - Voice and Data Cable: Blue.

C. Copper Cable Terminations: Insulation displacement connection (IDC) type using appropriate tool; use screw connections only where specifically indicated.

D. Jacks and Connectors: Modular RJ-45, non-keyed, terminated with 110-style insulation displacement connectors (IDC); high impact thermoplastic housing; suitable for and complying with same standard as specified horizontal cable; UL 1863 listed.

1. Performance: 500 mating cycles.
2. Voice and Data Jacks: 8-position modular jack, color-coded for both T568A and T568B wiring configurations.

E. Copper Patch Cords:

1. Description: Factory-fabricated 4-pair cable assemblies with 8-position modular connectors terminated at each end.

2.4 COMMUNICATIONS EQUIPMENT ROOM FITTINGS

A. Copper Cross-Connection Equipment:

1. Patch Panels for Copper Cabling: Sized to fit EIA/ECA-310 standard 19 inch (482.6 mm) wide equipment racks; 0.09 inch (2.2 mm) thick aluminum; cabling terminated on Type 110 insulation displacement connectors; printed circuit board interface.
   a. Jacks: Non-keyed RJ-45, suitable for and complying with same standard as cable to be terminated; maximum 48 ports per standard width panel.
   b. Capacity: Provide ports sufficient for cables to be terminated plus 25 percent spare.
   c. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively; comply with TIA-606.
   d. Provide incoming cable strain relief and routing guides on back of panel.

B. Backboards: Interior grade plywood without voids, 3/4 inch (19 mm) thick; UL-labeled fire-retardant.

1. Size: 48 by 96 inches (1220 by 2440 mm).
2. Do not paint over UL label.

2.5 COMMUNICATIONS OUTLETS

A. Outlet Boxes: Comply with Section 26 0533.16.

1. Provide depth as required to accommodate cable manufacturer's recommended minimum conductor bend radius.
2. Minimum Size, Unless Otherwise Indicated:
   a. Data or Combination Voice/Data Outlets: 4 inch square by 2-1/8 inch deep (100 by 54 mm) trade size.

B. Wall Plates:

1. Comply with system design standards and UL 514C.
2. Accepts modular jacks/inserts.
3. Capacity:
   a. Data or Combination Voice/Data Outlets: 6 ports.

4. Wall Plate Material/Finish - Flush-Mounted Outlets: Match wiring device and wall plate finishes specified in Section 26 2726.

2.6 IDENTIFICATION PRODUCTS

A. Comply with TIA-606.

B. Comply with Section 26 0553.

2.7 SOURCE QUALITY CONTROL

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

B. Factory test cables according to TIA-568 (SET).

PART 3 EXECUTION

3.1 INSTALLATION - GENERAL

A. Comply with latest editions and addenda of TIA-568 (SET) (cabling), TIA-569 (pathways), TIA-607 (grounding and bonding), BICSI N1, NFPA 70, and SYSTEM DESIGN as specified in PART 2.

3.2 INSTALLATION OF PATHWAYS

A. Install pathways with the following minimum clearances:

1. 48 inches (1220 mm) from motors, generators, frequency converters, transformers, x-ray equipment, and uninterruptible power systems.
2. 12 inches (300 mm) from power conduits and cables and panelboards.
3. 5 inches (125 mm) from fluorescent and high frequency lighting fixtures.
4. 6 inches (150 mm) from flues, hot water pipes, and steam pipes.

B. Outlet Boxes:

1. Coordinate locations of outlet boxes provided under Section 26 0533.16 as required for installation of telecommunications outlets provided under this section.
   a. Mounting Heights: Unless otherwise indicated, as follows:
      1) Telephone and Data Outlets: 18 inches (450 mm) above finished floor.
   b. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
   c. Unless otherwise indicated, provide separate outlet boxes for line voltage and low voltage devices.
   d. Locate outlet boxes so that wall plate does not span different building finishes.
   e. Locate outlet boxes so that wall plate does not cross masonry joints.

3.3 INSTALLATION OF EQUIPMENT AND CABLING

A. Cabling:

1. Do not bend cable at radius less than manufacturer's recommended bend radius; for unshielded twisted pair use bend radius of not less than 4 times cable diameter.
2. Do not over-cinch or crush cables.

3. Do not exceed manufacturer's recommended cable pull tension.
4. When installing in conduit, use only lubricants approved by cable manufacturer and do not chafe or damage outer jacket.

B. Service Loops (Slack or Excess Length): Provide the following minimum extra length of cable, looped neatly:

1. At Distribution Frames: 120 inches (3000 mm).
2. At Outlets - Copper: 12 inches (305 mm).

C. Copper Cabling:

1. Category 5e and Above: Maintain cable geometry; do not untwist more than 1/2 inch (12 mm) from point of termination.
2. For 4-pair cables in conduit, do not exceed 25 pounds (110 N) pull tension.
3. Use T568B wiring configuration.

D. Identification:

1. Use wire and cable markers to identify cables at each end.
2. Use manufacturer-furnished label inserts, identification labels, or engraved wallplate to identify each jack at communications outlets with unique identifier.
3. Use identification nameplate to identify cross-connection equipment, equipment racks, and cabinets.

3.4 FIELD QUALITY CONTROL

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

B. Comply with inspection and testing requirements of specified installation standards.

C. Visual Inspection:

1. Inspect cable jackets for certification markings.
2. Inspect cable terminations for color coded labels of proper type.
3. Inspect outlet plates and patch panels for complete labels.

D. Testing - Copper Cabling and Associated Equipment:

1. Test backbone cables after termination but before cross-connection.
2. Test backbone cables for DC loop resistance, shorts, opens, intermittent faults, and polarity between connectors and between conductors and shield, if cable has overall shield.
3. Test operation of shorting bars in connection blocks.
4. Category 5e and Above Backbone: Perform near end cross talk (NEXT) and attenuation tests.

E. Final Testing: After all work is complete, including installation of telecommunications outlets, and telephone dial tone service is active, test each voice jack for dial tone.

END OF SECTION

SECTION 28 4600
DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM

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. Manual fire-alarm boxes.
2. System smoke detectors.
3. Heat detectors.
4. Notification appliances.

1.3 DEFINITIONS

A. LED: Light-emitting diode.

B. NICET: National Institute for Certification in Engineering Technologies.

1.4 SYSTEM DESCRIPTION

A. Noncoded addressable system, with automatic sensitivity control of certain smoke detectors and multiplexed signal transmission, dedicated to fire-alarm service only.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For fire-alarm system. Include plans, elevations, sections, details, and attachments to other work.

1. Comply with recommendations in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72.
2. Include voltage drop calculations for notification appliance circuits.
3. Include battery-size calculations.
4. Include performance parameters and installation details for each detector, verifying that each detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
5. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale and coordinating installation of duct smoke detectors and access to them. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators. Locate detectors according to manufacturer's written recommendations.
6. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits.

C. General Submittal Requirements:

1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect.
2. Shop Drawings shall be prepared under the supervision of persons with the following qualifications:
    a. NICET-certified fire-alarm technician, Level IV minimum.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Comply with the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
2. Provide "Record of Completion Documents" according to NFPA 72 article "Permanent Records" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter.
3. Record copy of site-specific software.
4. Provide "Maintenance, Inspection and Testing Records" according to NFPA 72 article of the same name and include the following:
    a. Frequency of testing of installed components.
    b. Frequency of inspection of installed components.
    c. Requirements and recommendations related to results of maintenance.
    d. Manufacturer's user training manuals.
5. Manufacturer's required maintenance related to system warranty requirements.
6. Abbreviated operating instructions for mounting at fire-alarm control unit.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On magnetic media or compact disk, complete with data files.
3. Device address list.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project. Firm with minimum 3 years documented experience installing fire alarm systems of the specified type and providing contract maintenance service as a regular part of their business.

B. Designer Qualifications: NICET Level III or IV (3 or 4) certified fire alarm technician or registered fire protection engineer, employed by fire alarm control panel manufacturer, Contractor, or installer, with experience designing fire alarm systems in the jurisdictional area of the authorities having jurisdiction.

C. Source Limitations for Fire-Alarm System and Components: Obtain fire-alarm system from single source from single manufacturer. Components shall be compatible with, and operate as, an extension of existing system.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

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

F. NFPA Certification: Obtain certification according to NFPA 72 by an NRTL.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. EXISTING: FireLite, by Honeywell

2.2 SYSTEMS OPERATIONAL DESCRIPTION

A. Fire-alarm signal initiation shall be by one or more of the following devices:

1. Manual stations.
2. Heat detectors.
3. Smoke detectors.
4. Duct smoke detectors.
5. Automatic sprinkler system water flow.

B. Fire-alarm signal shall initiate the following actions:

1. Continuously operate alarm notification appliances.
2. Identify alarm at fire-alarm control unit.
3. Transmit an alarm signal to the remote alarm receiving station.
4. Activate voice/alarm communication system.
5. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
6. Record events in the system memory.

C. Supervisory signal initiation shall be by one or more of the following devices and actions:

1. Valve supervisory switch.
2. Low-air-pressure switch of a dry-pipe sprinkler system.

D. System trouble signal initiation shall be by one or more of the following devices and actions:

1. Open circuits, shorts, and grounds in designated circuits.
2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
3. Loss of primary power at fire-alarm control unit.
4. Ground or a single break in fire-alarm control unit internal circuits.
5. Abnormal ac voltage at fire-alarm control unit.

6. Break in standby battery circuitry.
7. Failure of battery charging.
8. Abnormal position of any switch at fire-alarm control unit or annunciator.

E. System Trouble and Supervisory Signal Actions: annunciate at fire-alarm control unit and remote annunciators. Record the event in system memory.

F. System Trouble and Supervisory Signals Actions: annunciate at fire-alarm control unit and remote control units. Record the event in system memory.

2.3 FIRE-ALARM CONTROL UNIT - EXISTING TO REMAIN

A. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.

1. Batteries: Sealed lead calcium.

2.4 MANUAL FIRE-ALARM BOXES

A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.

1. Double-action mechanism requiring two actions to initiate an alarm, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
2. Station Reset: Key- or wrench-operated switch.

2.5 SYSTEM SMOKE DETECTORS

A. General Requirements for System Smoke Detectors:

1. Comply with UL 268; operating at 24-V dc, nominal.
2. Detectors shall be four-wire type.
3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
4. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
6. Integral Visual-Indicating Light: LED type indicating detector has operated.
7. Remote Control: Unless otherwise indicated, detectors shall be analog-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition and individually adjustable for sensitivity by fire-alarm control unit.

a. Provide multiple levels of detection sensitivity for each sensor.

B. Photoelectric Smoke Detectors:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.

2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
    a. Primary status.
    b. Device type.

C. Duct Smoke Detectors: Photoelectric type complying with UL 268A.

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
    a. Primary status.
    b. Device type.
3. Each sensor shall have multiple levels of detection sensitivity.
4. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
5. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.

2.6 HEAT DETECTORS

A. General Requirements for Heat Detectors: Comply with UL 521.

B. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F (57 deg C) or a rate of rise that exceeds 15 deg F (8 deg C) per minute unless otherwise indicated.

1. Mounting: Twist-lock base interchangeable with smoke-detector bases.

C. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature of 190 deg F (88 deg C).

1. Mounting: Twist-lock base interchangeable with smoke-detector bases.

2.7 NOTIFICATION APPLIANCES

A. General Requirements for Notification Appliances: Individually addressed, connected to a signaling line circuit, equipped for mounting as indicated and with screw terminals for system connections.

B. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet (3 m) from the horn, using the coded signal prescribed in UL 464 test protocol.

C. Visible Notification Appliances: Xenon strobe lights comply with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- (25-mm-) high letters on the lens.

1. Rated Light Output:
    a. 15/30/75/110 cd, selectable in the field.
2. Mounting: Wall mounted unless otherwise indicated.
3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
4. Flashing shall be in a temporal pattern, synchronized with other units.

5. Strobe Leads: Factory connected to screw terminals.
6. Mounting Faceplate: Factory finished, red.

D. Voice/Tone Notification Appliances:

1. Appliances shall comply with UL 1480 and shall be listed and labeled by an NRTL.
2. High-Range Units: Rated 2 to 15 W.
3. Low-Range Units: Rated 1 to 2 W.
4. Mounting: Flush.
5. Matching Transformers: Tap range matched to acoustical environment of speaker location.

PART 3 EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Comply with NFPA 72 for installation of fire-alarm equipment.

B. Install wall-mounted equipment, with tops of cabinets not more than 72 inches (1830 mm) above the finished floor.

C. Smoke- or Heat-Detector Spacing:

1. Comply with NFPA 72, "Smoke-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for smoke-detector spacing.
2. Smooth ceiling spacing shall not exceed 30 feet (9 m).
3. HVAC: Locate detectors not closer than 3 feet (1 m) from air-supply diffuser or return-air opening.
4. Lighting Fixtures: Locate detectors not closer than 12 inches (300 mm) from any part of a lighting fixture.

D. Duct Smoke Detectors: Comply with NFPA 72 and IMC. Install sampling tubes so they extend the full width of duct.

E. Remote Status and Alarm Indicators: Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.

F. Audible Alarm-Indicating Devices: Install not less than 6 inches (150 mm) below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille.

G. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches (150 mm) below the ceiling.

H. Device Location-Indicating Lights: Locate in public space near the device they monitor.

I. Fire-Alarm Control Unit: Surface mounted, with tops of cabinets not more than 72 inches (1830 mm) above the finished floor.

3.2 CONNECTIONS

A. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 3 feet (1 m) from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.

1. Supervisory connections at valve supervisory switches.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

B. Install framed instructions in a location visible from fire-alarm control unit.

3.4 FIELD QUALITY CONTROL

A. Field tests shall be witnessed by authorities having jurisdiction.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Tests and Inspections:

1. Visual Inspection: Conduct visual inspection prior to testing.

a. Inspection shall be based on completed Record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" Table in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter.

2. System Testing: Comply with "Test Methods" Table in the "Testing" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.

3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.

4. Test visible appliances for the public operating mode according to manufacturer's written instructions.

5. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.

E. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.

F. Fire-alarm system will be considered defective if it does not pass tests and inspections.

G. Prepare test and inspection reports.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

END OF SECTION