PROJECT MANUAL

PROJECT NAME:

WRC Decentralization Phase 4 & Fire Alarm & Fire Suppression Phase 3 (#9279.40 & #9279.41) Bid Issuance #4

PROJECT ADDRESS:
1251 334th Street
Woodward, Iowa 50276
PROJECT DATE: March 27, 2026

OWNER:
Iowa Department of Administrative Services
109 Southeast 13th Street
Des Moines, Iowa 50319

OWNER PROJECT NUMBER: 9279.40 & 9279.41

OWNER REQUEST FOR BID NUMBER: RFB 927940-04

CONSTRUCTION MANAGER:
Story Construction
2810 Wakefield Circle
Ames, Iowa 50010

CONSTRUCTION MANAGER PROJECT NUMBER: 24501

ARCHITECT:
Shive-Hattery Inc.
4125 Westown Parkway Suite 100
West Des Moines, Iowa 50266

ARCHITECT PROJECT NUMBER: 2240007040

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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.

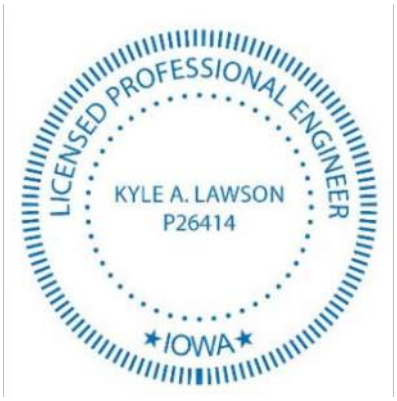
Printed or typed name: Cameron L. Manley

Cameron L. Manley — 03/30/2026

Signature **Date**

License Expires: 06-30-2027

Pages, Sheets, or Divisions covered by this Seal: Divisions 02, 06, 07, 08, 09, and 14



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.

Kyle A — 03/30/2026

Signature **Date**

Printed or typed name: Kyle A. Lawson

License Number: 26414

My license renewal date is: 12-31-2026

Pages, Sheets, or Divisions covered by this Seal: Division 03



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.

John Baumhover — 03/30/2026

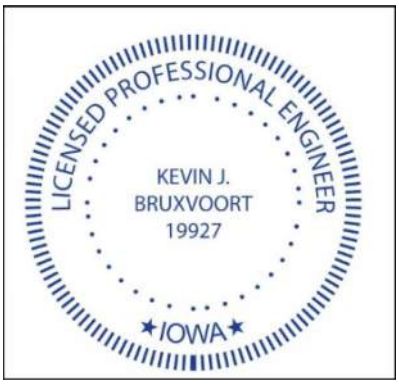
Signature **Date**

Printed or typed name: John D. Baumhover

License Number: 25737

My license renewal date is: 12-31-2026

Pages, Sheets, or Divisions covered by this Seal: Divisions 21 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.

Kevin Bruxvoort _____ 03/30/2026

Signature **Date**

Printed or typed name: Kevin J. Bruxvoort
License Number: 19927
My license renewal date is: 12-31-2027
Pages, Sheets, or Divisions covered by this Seal: Divisions 26 and 28

END OF SECTION

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LIST OF DRAWING SHEETS

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A.	00-G000	Cover Sheet
B.	00-G001	Campus Map
C.	00-G101	Code Summary
D.	00-C001	General Notes
E.	00-CD01	Existing Conditions and Demolition Plan
F.	00-CD02	Existing Conditions and Demolition Plan
G.	00-C101	Site Plan
H.	00-C102	Site Plan
I.	00-C201	Grading Plan
J.	00-C202	Grading Plan
K.	00-C501	Construction Details
L.	00-A000	Architectural General Information
M.	00-A001	Architectural General Information
N.	00-A002	Architectural General Information
O.	00-FP000	Fire Protection General Information
P.	00-M000	General Mechanical and Plumbing Symbols & Notes
Q.	00-E000	Electrical General Information
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T.	09-AD00	Basement Demolition Plan – Building A & B
U.	09-AD01	First Floor Demolition Plan – Building A & B
V.	09-AD02	Second Floor Demolition Plan – Building A & B
W.	09-AD10	Basement Demolition RCP – Building A & B
X.	09-AD11	First Floor Demolition RCP – Building A & B
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BB.	09-A102	Second Floor Plan – Building A & B
CC.	09-A110	Basement RCP – Building A & B
DD.	09-A111	First Floor RCP – Building A & B
EE.	09-A112	Second Floor RCP – Building A & B
FF.	09-FP100	Basement Fire Protection Plan
GG.	09-FP101	First Floor Fire Protection Plan
HH.	09-FP102	Second Floor Fire Protection Plan
II.	09-MD100	Basement Mechanical Piping Demolition Plan
JJ.	09-MD101	First Floor Mechanical Piping Demolition Plan
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LL.	09-MD200	Basement Mechanical Ductwork Demolition Plan
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SS.	09-M400	Building A & B Enlarged AHU Plans
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UU.	09-M402	Building A & B Natural Gas Plan
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JJJ.	12-FP100	Med Center Basement Plan
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FFFF.	13-MD201	First Floor Mechanical Ductwork Demolition Plan
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KKKK.	13-M300	Thermostat Plan
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PPPP.	13-M501	Mechanical Control
QQQQ.	13-M502	Mechanical Controls
RRRR.	13-M600	Mechanical Schedules
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UUUU.	13-ED202	Second Floor C & D - Demolition Plan
VVVV.	13-E100	Basement Level C & D – Lighting Plan
WWWW.	13-E101	First Floor C & D - Lighting Plan
XXXX.	13-E102	Second Floor C & D - Lighting Plan

YYYY.	13-E200	Basement Level C & D – Power Plan
ZZZZ.	13-E201	First Floor C & D – Power Plan
AAAAA.	13-E202	Second Floor C & D - Power Plan
BBBBB.	13-E600	Electrical Schedules

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SECTION 00 0116

BID SUBMITTAL CHECKLIST

PART 1 - **GENERAL**

1.01 **BID SUBMITTAL CHECKLIST**

A. The Bidder is responsible to see that the bid is submitted online at IMPACS Electronic Procurement System on or before the due date and time specified. Late bids shall not be accepted.
B. Bids shall be typewritten or in ink. All information requested shall accompany the bid. All blocks shall be completed. Errors shall be lined out and initialed.
C. The right is reserved to reject any or all bids. The State may waive minor deficiencies or informalities in the best interest of the State of Iowa.
D. A properly prepared and submitted bid document is the bidder's responsibility.
E. Bids cannot be changed after the bid opening.
F. In all cases, no verbal communications by any party will override written communications from the issuing office.
G. The Bid Form shall be completed in full and signed and submitted by an officer of the bidder with authority to bind in a contract.
H. If Bid Bond is called for, it shall accompany the Bid submission.
I. If Non-discrimination Clause information is called for, it shall accompany the Bid submission
J. If Targeted Small Business Pre-bid Contact information is called for, it shall accompany the Bid submission.
K. If Certificate of Site Visit form is called for, it shall accompany the Bid submission.

PART 2 - **PRODUCTS – NOT USED**

PART 3 - **EXECUTION – NOT USED**

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SECTION 00 1113

NOTICE TO BIDDERS

RFB #927940-04

The Iowa Department of Administrative Services will be receiving bids for replacing the steam and chilled water systems with new air handler units, replacing current fire alarm, elevator repairs and installing a new fire suppression system in Linden Court buildings A & B and C & D at Woodward Resource Center 1251 334th Street, Woodward, Iowa 50276.

The Iowa Department of Administrative Services anticipates construction to begin on July 6, 2026 and end on February 25, 2028.

Bids must be received no later than **2:00pm, Thursday, June 4th, 2026**. Late bids will not be considered. Bids shall be submitted on IMPACS Electronic Procurement System. The Bid shall be accompanied by a Bid Security as set forth in the Instructions to Bidders in the amount of 5% of the total bid amount. Each bid shall be accompanied by a bid bond, cashier's check or a certified check drawn upon a solvent bank chartered under the laws of the United States of America.

Bid Opening
The time and place of bid opening will be held at https://teams.microsoft.com/meet/296579304178641?p=v9v9M6Zhp79N0HdjN5 and teleconference number +1 469-998-6043 Pin: 759774972# at 3:00 pm on June 4th,2026.

The Iowa Department of Administrative Services reserves the right to reject any and all bids, and to waive irregularities and to accept a bid that is deemed in the best interest of the State of Iowa.

Bidders must comply with all affirmative action/equal employment opportunity provisions of the State of Iowa and the Federal Government.

This project is exempt from Iowa Sales Tax. Davis Bacon Wages **will not** apply to this project.

Questions must be submitted by 10:00 am, May 27th, 2026, to the Issuing Officer.

Bidding documents may stipulate a specific product. Substitute product will be considered if a written request is received by 10:00 am, May 27th, 2026, prior to bid opening. Substitution requests will be considered for all products per Section 01 2500 Substitution Procedures, even if the specification does not include a statement such as "or equal," "equal to," "equivalent to," or "basis of design," unless otherwise noted.

An **optional** Pre-Bid meeting will be held on Friday, May 15th, 2026, at 10:00 am at the Story CP2.0 trailer located at the Woodward Resource Center 1251 334th Street, Woodward, Iowa 50276. This meeting is not mandatory but is highly recommended.

Bidding Documents, including drawing sheets bearing the project name WRC Decentralization Phase 4 & Fire Alarm & Fire Suppression Phase 3 (#9279.40 & #9279.41) Bid Issuance ***#4***, Dated 3/27/2026 and the Project Manual prepared by Shive-Hattery dated 3/27/2026, may be obtained from Rapids Reproductions by visiting www.rapidsrepro.com or by calling (515) 251-3222 on Monday through Friday 8:00 am to 5:00 pm.

For further information regarding this project contact:
Michael Bradbury – Issuing Officer
Phone: (515) 823-9327
E-Mail: construction.procurement@das.iowa.gov

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SECTION 00 2113

INSTRUCTIONS TO BIDDERS

RFB #927940-04

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Project Description
B. Owner
C. State Agency Representatives and Contacts
D. Proposal Form and Submissions
E. Taxes
F. Alternate Bids
G. Drawings
H. Bid Security
I. Due Date and Time for Receipt of Bids
J. Commencement and Completion Date
K. Site Visit
L. Pre-bid Meeting
M. Questions
N. Addenda and Interpretations of the Contract Documents
O. Substitutions
P. Obligation of Bidder
Q. Public Records and Requests for Confidential Treatment
R. Withdrawal of Bid
S. Bid Closing
T. Basis of Bids
U. Informalities/Rejection of Bids
V. Consideration of Bids
W. Preference
X. Qualifications
Y. Insurance
Z. Form of Agreement between Owner and Contractor
AA. Execution of Contract
BB. Laws and Regulations
CC. Contract Documents and Order of Precedence
DD. Conditions of the Work
EE. Subcontracts
FF. Project Manual/Drawings

1.02 PROJECT DESCRIPTION

A. Project Description: Replacing the steam and chilled water systems with new air handler units, replacing current fire alarm, elevator repairs and installing a new fire suppression system in Linden Court buildings A & B and C & D.

1.03 OWNER

A. State of Iowa, Department of Administrative Services, 109 SE 13th St, Des Moines, IA 50319

1.04 STATE AGENCY REPRESENTATIVES AND CONTACTS

A. PURCHASING AGENT: Michael Bradbury – Issuing Officer, State of Iowa, Department of Administrative Services, Hoover State Office Building, 3rd floor, 1305 East Walnut Street, Des Moines, IA 50319-0105, Phone: 515-823-9327; email: construction.procurement@das.iowa.gov

B. OWNER REPRESENTATIVE: Jennifer Kleene, State of Iowa, Department of Administrative Services, 109 SE 13th Street, Des Moines, IA 50319, Phone: 515-822-8197; email: jennifer.kleene@das.iowa.gov

C. ON-SITE COORDINATOR: Rodney Carr, Plant Operations Manager, 1251 334th Street, Woodward, Iowa 50276, Phone: 515-314-6643; email: Rodney.carr@hhs.iowa.gov

D. CONSTRUCTION MANAGER CONTACT: Darren Milliken, Story Construction, 2810 Wakefield Circle, Ames, Iowa 50226, Phone: 515-291-5358; email: darren.milliken@storycon.com

E. DESIGN PROFESSIONAL CONTACT: Chris Bauer, Shive-Hattery Inc., 4125 Westown Parkway Suite 100, West Des Moines, Iowa 50266, Phone: 515-669-0695; email: cbauer@shive-hattery.com

F. COMMISSIONING AGENT CONTACT: Andrew Bennett, SystemWorks, 409 Fifth Street, West Des Moines, Iowa 50265, Phone: 515-975-8251; email: andrew.bennett@systemworksllc.com

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.01 PROPOSAL FORM AND SUBMISSION

A. A properly prepared and submitted bid is the bidder's responsibility. Bids are to be made in accordance with these Instructions to Bidders and items included on the Bid submission. Failure to comply may be cause for rejection.

B. The Bid is to consist of the required Bid information, together with the other information specified below to be submitted with the Bid, in which copies are included with these Bidding Documents.
   1. The total bid package submitted is required to include the following:
      a. An online submission including:
         1) Required Bid Form (To be uploaded online)
         2) Required Non-discrimination Clause Information
         3) Required Targeted Small Business Pre-bid Contact Information
         4) Bid Security (documentation provided by Bidder) (To be uploaded online) (Required)
         5) Certification of Site Visit (To be uploaded online if Pre-Bid is Mandatory)

C. Include the amount for performing all work described in the drawings and specifications for Base Bid and for each Alternate Bid requested.

D. Acknowledge receipt of all Addenda issued, where so indicated on the Bid Form

E. All required information to be submitted, by an officer of the company having authority to bind the company in a contract.

F. Commencement of the work of the contract shall begin with the Contractor's receipt of a fully executed contract (signed by both parties).

G. The Owner reserves the right to award a contract for Base Bid only, or for Base Bid in combination with any, or all, identified Alternate Bids. The Owner reserves the right to award a contract for individual Bid Packages, or any combination of Bid Packages. Each Bidder must comply with all of the General Requirements of the project and any requirements of the Project manual that apply to their scope of work.

H. The company's Federal I.D. Number and the Iowa Contractors Registration Number shall be included in the Bid Form.

I. Unless indicated otherwise, the Bid shall be for a single responsibility contract for all work as indicated on the Drawings and specified in the Project Manual, and shall be a lump sum amount.

If no change in the Base Bid amount is required with respect to consideration of a particular Alternate Bid, enter “No Change” in the blank for that Alternate Bid.

J. Where so requested, provide Unit Prices for the designated types of work and in the units specified, in which the Unit Prices would be used as adjustments to the quantities described in the instructions as the basis for the Base Bid and any Alternate Bid work. A Unit Price would be applicable in the event the Owner should request additional work of that type beyond the extent and quantity that has been established as the scope of the work by graphic delineation and notations on the Drawings, or by otherwise stipulating in the Bidding Documents a numerical quantity of the work, for the Bidder’s use in determining the lump sum bid amount for the Base Bid and any requested Alternate Bid containing such work. The Unit Prices shall also be used to adjust the Contract Amount for actual quantities of work involved when the work subject to Unit Price adjustment differs by being less in quantity than that contemplated by the original scope of work for the respective Base Bid or Alternate Bid.

K. Completed State of Iowa Nondiscrimination Clause information and Subcontractor Targeted Small Business Enterprise Pre-Bid Contact Information, included in these Bidding Documents, are to accompany the Bid submission. Bidders shall comply with all affirmative action/equal opportunity provisions of State and Federal laws. The Owner seeks to provide opportunities for Targeted Small Businesses in accordance with the provisions of Chapter 73 of the Code of Iowa.

L. All Bid information is to be submitted online. Any required Bid Security shall be provided, in the form and amount specified elsewhere in these Instructions to Bidders, at the time of submission of the Bid. When a site visit is mandatory as specified elsewhere in these Instructions to Bidders, and a Certificate of Site Visit is required to be submitted with the Bid as evidence of such visit having occurred for purposes of observing the conditions of the site and the work proposed therein, the Certificate shall be uploaded with the bid submission.

3.02 TAXES

A. In accordance with Section 423 of the Code of Iowa and 701-19 of the Iowa Administrative Rules, Iowa Construction Sales Tax Exemption Certificates for this project will be issued. Do not include Iowa sales tax or use tax, or any local option sales tax, on construction materials in determining your bid prices. The successful Contractor will be required to notify the Department of Administrative Services project manager of all Subcontractors within forty-eight (48) hours after the published date and time by which bids must be submitted. Information on the Contractor and each Subcontractor shall include the firms' name, address, contact person, federal tax identification number, and the Iowa contractor registration number. For the Contractor and each Subcontractor, designate the type of trade or category of work that is to be provided on the project. The Construction Manager for the Department of Administrative Services must be informed when any Subcontractor is added to the project. Following receipt of the information, the Construction Manager for the Department of Administrative Services will arrange to have an authorization letter and certificate (please see sample, included in the Project Manual) issued on behalf of the Contractor and each Subcontractor and will forward the documents to the Contractor for distribution and use by each in purchasing construction materials for this project. Certificates issued for this project shall be used for tax-exempt purchasing construction materials for this project only.

3.03 ALTERNATE BIDS

A. Bidders are to bid all Alternates requested on the Bid Form. Alternates quoted will be reviewed and accepted or rejected at the option of the Department of Administrative Services. Accepted Alternates will be identified in the Owner-Contractor agreement. Indicate the price for Alternates described, as shown on the Drawings and specified in the Project Manual, and identify in the correct location on the Bid Form.

3.04 DRAWINGS AND PROJECT MANUAL

A. Drawings and Project Manual are specified in the Notice to Bidders or any extension thereof made by Addendum.

3.05 BID SECURITY

A. Each Bid shall be accompanied by Bid Security.
B. The Bid Security shall be in the form of a Bid Bond, Certified check, or Cashier's check in an amount not less than five percent (5%) of the maximum value of the Bid, including any additive Alternates. NOTE: Checks other than Certified checks and Cashier's checks will not be accepted. Bonds shall be issued by a bonding company licensed to transact business in the State of Iowa. The Attorney in Fact who signs the Bond shall file with the Bond a certified and effectively dated copy of their Power of Attorney. The Bid Security shall be made payable to the Iowa Department of Administrative Services, and shall accompany the Bid. If a Bid Bond is not used, copies of Certified checks or Cashier's checks must be uploaded and hand delivered, in a sealed envelope, or mailed upon request. The Bid Security shall serve as a guarantee that a Bidder who is offered a contract will enter into an Agreement with the State of Iowa and will file an approved surety company's Performance Bond, Payment Bond and the Insurance Certificates as evidence of the required Insurance prior to execution of the contract. Upon failure to comply, the Bid Security shall be forfeited as liquidated damages. The governmental entity shall retain the bid security furnished by the successful bidder until the approved contract form has been fully executed, a bond has been filed by the bidder guaranteeing the performance of the contract, and the contract and bond have been approved by the governmental entity. The provisions of chapter 573, where applicable, apply to contracts awarded under this chapter. The governmental entity shall promptly return the checks or bidder's bonds of unsuccessful bidders to the bidders once the Notice of Intent to Award is issued.

3.06 DUE DATE AND TIME FOR RECEIPT OF BIDS

A. Properly completed Bids shall be submitted online through IMPACS Electronic Procurement System, no later than the time and date specified in the Notice to Bidder or any extension thereof made by Addendum. Written, emailed, oral or telephonic Bids are invalid, and will not receive consideration. The Bidder shall assume full responsibility for the timely online submission of the Bid. Late bids will not be accepted.

3.07 COMMENCEMENT AND COMPLETION DATES

A. Commencement of the Work of the Contract shall be the day of receipt by the selected Contractor of the fully-executed contract. Final completion of the Work of the contract shall be acknowledged as a part of the Contractor's proposal.

3.08 SITE VISIT

A. A site visit by the prospective bidder is highly recommended at the time of the Pre-Bid Meeting of this project.

3.09 PRE-BID MEETING

A. Pre-Bid Meeting will be specified in the Notice to Bidders or any extension thereof made by Addendum.

3.010 QUESTIONS

A. Questions on this project may be raised and discussed at the time of the Pre-Bid Meeting or by submitting in writing to the issuing officer as specified in the Notice to Bidders or any extension thereof made by Addendum.

3.011 ADDENDA AND INTERPRETATIONS OF THE CONTRACT DOCUMENTS

A. Any person contemplating submitting a proposal for the proposed Contract, who is in doubt as to the true meaning of any part of the Bidding Documents, shall submit a written request for an interpretation thereof. The person submitting a request will be responsible for its prompt delivery. Every request for such interpretation should reference the Bid Number specified in the Bidding Documents, and shall be made in writing (email preferred). Questions shall be submitted to the previously identified Purchasing Agent for the Department of Administrative Services. To be given consideration, requests shall be received as specified in the Notice to Bidders or any extension thereof made by Addendum. Replies, which revise or correct the Bidding Documents, or provide necessary clarifications, will be issued in the form of a written Addendum to the Bidding Documents. Interpretations, corrections or changes of the Bidding Documents made in any other manner will not be binding, and Bidders shall not rely upon such interpretations, corrections, or changes. The Bidder is to include any resultant cost changes in the Bid Sum. Addenda will be posted electronically at the respective bid site where the bid is initially posted. Acknowledgment by the Bidder of each issued Addendum shall be noted in the location so indicated on the Bid. All Addenda issued shall become part of the Contract Documents.

3.012 SUBSTITUTIONS

A. Where the Bidding Documents stipulate a specific product be provided by naming one or more manufacturer and model, a substitute product will be considered when a written request is received as specified in the Notice to Bidders or any extension thereof made by Addendum prior to bid opening. Substitution requests will be considered for all products per Section 01 2500 Substitution Procedures, even if the specification does not include a statement such as “or equal,” “equal to,” “equivalent to,” or “basis of design,” unless otherwise noted. Substitution requests shall be emailed to the Issuing Officer at the email address provided in Instructions to Bidders Section 1.04.

3.013 OBLIGATION OF BIDDER

A. It shall be the responsibility of each Bidder contemplating the submission of a Bid for the proposed Contract to fully acquaint himself/herself with conditions at the work site, project requirements, and to become acquainted thoroughly with the work, and all conditions that may be related to it. No considerations or revision in the contract price or scope of the project will be considered by the Owner for any item that could have been revealed by a thorough on-site inspection and examination.

B. By submission of a Bid, it shall be understood that the Bidder assures that he/she has reviewed and is thoroughly familiar with the project requirements, contract conditions and supplementary conditions, the drawings, specifications, addenda, and that the bidder is aware of the conditions existing at the site that may relate to the work of this project. Failure of any Bidder to examine any form, document, or other instrument shall in no way relieve the Bidder from any obligation in respect to his/her Bid.

3.014 PUBLIC RECORDS AND REQUESTS FOR CONFIDENTIAL TREATMENT

A. The Agency's release of public records is governed by Iowa Code chapter 22. Contractors are encouraged to familiarize themselves with Chapter 22 before submitting a Proposal. The Agency will copy and produce public records upon request as required to comply with Chapter 22 and will treat all information submitted by a Contractor as non-confidential records unless Contractor requests specific parts of the Proposal be treated as confidential at the time of the submission as set forth herein AND the information is confidential under Iowa or other applicable law.

B. A Contractor requesting confidential treatment of specific information must: (1) fully complete Form 22 (Available at https://das.iowa.gov/sites/default/files/procurement/pdf/Form%2022-ConfidentialityRequest-RFB.pdf), (2) identify the request in the transmittal letter with the Contractor's Proposal, (3) conspicuously mark the outside of its Proposal as containing confidential information, (4) mark each page upon which confidential information appears, and (5) submit a "Public Copy" from which the confidential information has been excised.

C. Form 22 will not be considered fully complete unless, for each confidentiality request, the Contractor: (1) enumerates the specific grounds in Iowa Code chapter 22 or other applicable law that supports treatment of the material as confidential, (2) justifies why the material should be maintained in confidence, (3) explains why disclosure of the material would not be in the best interest of the public, and (4) sets forth the name, address, telephone, and e-mail for the person authorized by Contractor to respond to inquiries by the Agency concerning the confidential status of such material.

D. The Public Copy from which confidential information has been excised is in addition to the number of copies requested in Section 3 of this RFP. The confidential material must be excised in such a way as to allow the public to determine the general nature of the material removed and to retain as much of the Proposal as possible.

E. **Failure to request information be treated as confidential as specified herein shall relieve Agency and State personnel from any responsibility for maintaining the information in confidence. Contractors may not request confidential treatment with respect to pricing information and transmittal letters. A contractor's request for confidentiality that does not comply with this section or a contractor's request for confidentiality on information or material that cannot be held in confidence as set forth herein are grounds for rejecting contractor's Proposal as non-responsive. Requests to maintain an entire Proposal as confidential will be rejected as non-responsive.**

F. If Agency receives a request for information that Contractor has marked as confidential and if a judicial or administrative proceeding is initiated to compel the release of such material, Contractor shall, at its sole expense, appear in such action and defend its request for confidentiality. If Contractor fails to do so, Agency may release the information or material with or without providing advance notice to Contractor and with or without affording Contractor the opportunity to obtain an order restraining its release from a court possessing competent jurisdiction. Additionally, if Contractor fails to comply with the request process set forth herein, if Contractor's request for confidentiality is unreasonable, or if Contractor rescinds its request for confidential treatment, Agency may release such information or material with or without providing advance notice to Contractor and with or without affording Contractor the opportunity to obtain an order restraining its release from a court possessing competent jurisdiction.

3.015 WITHDRAWAL OF BID

A. A Bid may be modified or withdrawn only before the time and date for receipt of Bids. Said request for modification or withdrawal of a bid must be completed online through IMPACS Electronic Procurement System. A Bid shall remain valid for consideration by the Owner for the following period(s) of time after the date specified for receipt of Bids, or until such time following that period that the apparent low bidder requests in writing that the Bid be withdrawn, after which the Bid may be withdrawn without forfeiture of any required Bid Security. The Bid shall be valid for not less than thirty (30) calendar days after the date Bids are specified to be due. With the approval of the Department of Administrative Services, a bid may be withdrawn after opening, but only if the bidder provides prompt written notification that adequately documents the commission of an honest error that may cause undue financial loss.

3.016 BID OPENING

A. All bids received on or before the due date and time specified in the Notice to Bidder or any extension thereof made by Addendum will be opened and the name of the Bidder and the amount of their Bid will be announced.

3.017 BASIS OF BIDS

A. The Bidder shall include all additional documents or appendices that are requested to be submitted concurrent with the Bid submission; failure to comply may be cause for rejection.
B. In accordance with Iowa law, Section 8A.311: A bidder, to be considered for an award of a state construction contract, shall disclose to the state agency awarding the contract the names of all subcontractors and suppliers who will work on the project being bid, within forty-eight (48) hours after the published date and time by which bids must be submitted. A bidder shall not replace a subcontractor or supplier disclosed without the approval of the state agency awarding the contract.
    1. A bidder, prior to an award or who is awarded a state construction contract, shall disclose all of the following, as applicable:
        a. If a subcontractor or supplier disclosed (under the preceding) by a bidder is replaced, the reason for replacement and the name of the new subcontractor or supplier;
        b. If the cost of work to be done by a subcontractor or supplier is changed or if the replacement of a subcontractor or supplier results in a change in the cost, the amount of the change in cost.
        c. Any reduction in subcontractor or supplier price as a result of the change, if the change is approved by the Owner, shall be deducted from the Trade Contract via a deductive Change Order. Any such changes, if approved by the Owner, which result in an increase in the Trade Contract Price shall be borne by the Trade Contractor.
C. The Bidder is specifically advised that any person, firm or other party to whom it is proposed to award a subcontract under this contract must:
    1. Be registered in the State of Iowa and have an Iowa Contractor's Registration number, and
    2. Be acceptable to the Owner.

3.018 INFORMALITIES/ REJECTION OF BIDS

A. The Iowa Department of Administrative Services reserves the right to waive any irregularities or informalities and to enter into a Contract with a Bidder, or to reject any or all bids as it deems to be in the best interest of the State, without penalty.

3.019 CONSIDERATION OF BIDS

A. It is the intent of the Department of Administrative Services to award a Contract to the lowest responsible Bidder, provided the Bid has been submitted in accordance with the requirements of the Bidding Documents and is determined to be compliant with all Bidding Requirements, and does not exceed the funds available for construction.
B. Bidder is to bid on each Alternate Bid requested. Failure to do so may result in disqualification of the bid. The Department of Administrative Services reserves the right to accept any, or no, Alternate Bid. Alternate Bids may be considered in any order or combination, and the low successful Bidder will be determined on the basis of the sum of the Base Bid and the Alternate(s) accepted at the time of the Contract award.
C. In evaluating Bids, any proposal offered by a Bidder for an alternate design, or for materials other than those shown or specified for the Base Bid or for Alternate Bid construction under the proposed Construction Documents or called for by any issued Addenda to those Construction Documents, will not be considered in determining the low successful Bidder. However, the Department of Administrative Services reserves the right to consider any such Bidder-proposed (Contractor's Alternate) alternate designs or materials with the low successful Bidder, after the low successful Bidder is determined in the manner described above (A and B).
D. Notice of Intent to Award the Bid(s) will be sent to all Respondents submitting a timely Bid and may be posted at the website shown on the RFB cover sheet. Negotiation and execution of the Contract(s) shall be completed no later than fifteen (15) days from the date of the Notice of Intent to Award or such other time as designated by Agency. If the successful Bidder fails to negotiate and deliver an executed Contract, including all required documents such as payment and performance bonds and insurance certificate, by that date, the Agency, in its sole discretion, may cancel the award and award the Contract to the remaining Bidder the Agency believes will provide the best value to the State.

3.020 PREFERENCE

A. By virtue of statutory authority, a preference shall be given to Iowa domestic labor, products produced and provisions grown within the state of Iowa, in accordance with the provisions of Chapter 73, Code of Iowa and any amendments thereto.
B. Enforcement of reciprocal resident bidder preference and resident labor force preference codified at Iowa Code Section 73A.21.
    1. NOTICE: Failure on the part of the bidder to carefully read the following paragraphs and to provide the information requested below may make the bidder's bid materially nonresponsive and therefore ineligible for contract award. Violations of Iowa Code Section 73A.2l may, among other things, result in civil penalties assessed by the Commissioner of the Division of Labor of Iowa Workforce Development. The bidder should seek out the advice of an attorney if he or she has questions about Iowa Code Section 73A.21. As a part of the competitive procurement of contracts for Public Improvements that must be awarded to the low bidder (if the bid is responsive and the bidder is deemed responsible), Public Bodies shall allow a preference to Resident Bidders if a Nonresident Bidder places a bid for the contract for the Public Improvement and that Nonresident Bidder's state or foreign country gives resident bidders of that state or foreign country a preference (including a labor force preference or any type of preferential treatment). The preference allowed, or reciprocally applied, shall be equal to the preference given or required by the state or foreign country in which the Nonresident Bidder is a resident bidder.
    "Public Body" means the State of Iowa (and its agencies) and any of its political subdivisions, including school districts, public utilities, and the state board of regents.
    "Public Improvement" means a building or other construction work to be paid for in whole or in part by the use of funds of the State of Iowa, its agencies, and any of its political subdivisions and includes road construction, reconstruction, and maintenance projects.
    "Resident Bidder" means a person or entity authorized to transact business in of the State of Iowa and having a place of business for transacting business within the State of Iowa 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. Note, however, that if a nonresident bidder's 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. "Nonresident Bidder" means a person or entity who does not meet the definition of a resident bidder.

C. Nonresident bidders shall be required to certify on the Bid submission, where so indicated, the state or foreign country in which the firm is a resident, and if that state or foreign country uses a percentage for in-state bidders and the amount of the preference.
D. If it is determined that this may cause denial of federal funds which would otherwise be available, or would otherwise be inconsistent with requirements of federal law, this section shall be suspended, but only to the extent necessary to prevent denial of the funds or to eliminate the inconsistency with federal requirements.

3.021 QUALIFICATIONS

A. In accordance with Iowa Code 26.9(2) and 26.16, no potential bidder shall be required to provide confidential or proprietary information or meet any class requirements as a precondition to submitting a responsive bid. However, as noted in Iowa Code 26.9(2), the lowest responsive bidder may be required to provide additional information to verify responsibility prior to and as a condition of obtaining final award of the contract. Any qualification requirements contained in any bid document indicates only preferred qualifications, not a precondition to bid, and the lowest responsive bidder's qualifications will be evaluated individually based on all information provided.
B. The Owner may make such investigations as he or she deems necessary to determine the ability of the awarded Bidder to perform the required work, and the awarded Bidder shall furnish to the Owner all such information and data for this purpose. The Owner reserves the right to rescind any awarded Bid if the evidence submitted by, or in investigation of, such Bidder fails to satisfy the Owner that the Bidder is properly qualified to carry-out the obligations of the Contract and to complete the Work contemplated therein.
C. Bidders shall be registered as a Construction Contractor with the Labor Commissioner, Iowa Workforce Development Department, as required by Chapter 91C of the Code of Iowa. Bidder's Iowa Contractor Registration Number shall be included in the location provided in the Bid Form.
D. Non-resident corporations submitting bids must be in compliance with Section 490.1501 of the Code of Iowa and legally authorized thereby to carry-on such business in the State of Iowa as is required by the Contract Documents.
E. An out-of-state Bidder, if awarded a contract, will be required to submit evidence of authorization to do business in the State of Iowa.

3.022 INSURANCE

A. Insurance Requirements
   1. The Contractor shall maintain in effect, with insurance companies of recognized responsibility, at its expense, insurance covering its work of the type and in amounts required by this Contract. The Contractor's insurance shall, among other things, insure against any loss or damage resulting from the Contractor's performance of this Contract. All such insurance policies shall remain in full force and effect for the entire life of this Contract and shall not be canceled or changed except after thirty (30) days written notice to the Owner.
   2. **Amounts of Insurance Required – Refer to ConsensusDOCS 802 (see template in Project Manual)**
B. Certificates of Coverage
   1. Certificates of the insurance described above shall be submitted to the Owner before starting any construction activities and shall be subject to approval by the Owner. The Contractor shall provide certificates for the insurance required. The insurer shall state in the certificate that no cancellation of the insurance will be made without at least thirty (30) days prior written notice to the Contractor. Upon receipt of any notice of cancellation or alteration, Contractor shall within ten (10) days procure other policies of insurance, similar in all respects to the

policy or policies, about to be canceled or altered, and, if the Contractor fails to provide, procure, and deliver acceptable policies of insurance, or satisfactory evidence thereof, in accordance with the terms hereof then, at the Owner's option, Owner may obtain such insurance at the cost and expense of Contractor, without the need of any notice to Contractor.

C. No Limitation of Liability
   1. Acceptance of the insurance certificates by the Owner shall not act to relieve the Contractor of any obligation under this Contract. All insurance policies and certificates shall be issued only by companies authorized to transact business in the State of Iowa. It shall be the responsibility of the Contractor to keep the respective insurance policies and coverage's current and in force during the life of this agreement.
   2. A Sample Certificate of Insurance is attached for reference following this Section.

3.023 FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

A. The Agreement for the Work will be written on ConsensusDOCS 802 Form of Agreement between Owner and Contractor (sample of the document with modifications incorporated is bound in this Project Manual).

3.024 EXECUTION OF CONTRACT

A. Contract documents shall mean and include the following:
   1. Contract: ConsensusDOCS 802
   2. Performance and Payment Bonds
   3. Project Manual
   4. Drawings
   5. Numbered Addenda issued after initial publication of Bid Documents
   6. Numbered Modifications (Change Orders) issued after Contract is signed

3.025 LAWS AND REGULATIONS

A. The Bidder's attention is directed to the fact that all applicable laws and regulations of Federal and State agencies having jurisdiction over the construction of this project shall apply to any contract resulting from this proposal, and it shall be deemed that those rules and regulations are made a part of such contract the same as if set forth in their entirety therein. By submitting a Bid, the Bidder confirms that he/she is familiar with and understands the Contractor's responsibility under all Federal and State of Iowa laws and regulations with respect to the Work described by the proposed Contract Documents.

3.026 CONTRACT DOCUMENTS AND ORDER OF PRECEDENCE

A. Where an irreconcilable conflict exists among Applicable Legal Requirements, this Contract, the specifications in the Materials and the Drawings, the earliest item mentioned in this sentence involving a conflict shall control over any later mentioned item or items subject to such conflict unless doing so would result in reducing the Bidder's duty of care or obligations under this Contract, in which case the terms resulting in the highest requirements for Bidder performance shall control.

3.027 CONDITIONS OF THE WORK

A. Each bidder must fully inform him/herself of the conditions under which the work is to be performed at the site of the work, the obstacles which may be encountered, and all other relevant matters concerning the work to be performed. Failure to do so will not relieve a successful bidder of the obligation to furnish all material and labor necessary to carry out the provisions of the contract. When a site visit is required by provisions located elsewhere in these Instructions to Bidders, as a site tour in conjunction with a mandatory Pre-Bid Meeting, it shall be the Bidder's responsibility to fulfill this obligation as a condition of bidding the Work described in the Bidding Documents.

B. No allowance will be made for any additional compensation by reason of any matter or condition with which the bidder might have fully informed him/herself, but failed to do so prior to bidding. Insofar as possible, the Contractor and all subcontractors shall employ such methods or means in carrying out the work so as not to cause any interruption of, or interference with, the work of any other subcontractor or trade.

3.028 SUBCONTRACTS

A. The Prime Contractor shall be responsible for notifying all subcontractors and suppliers and informing them that they are bound in each case by all applicable provisions of the bidding information and those of the proposed Form of Agreements as defined in the Contract Documents.

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SECTION 00 2113.01

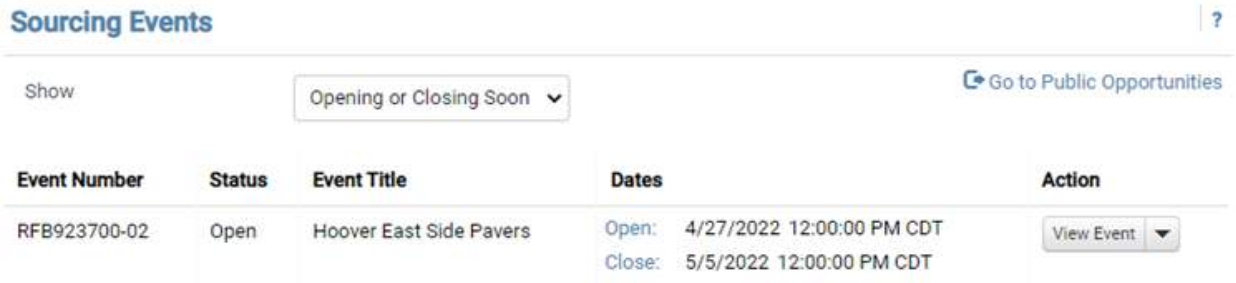
IMPACS Public Construction Bidders User Guide

Public construction bids must be submitted on-line at IMPACS Electronic Procurement System.

Bidders must be registered in IMPACS to submit a Bid.

To create an account, enter your email address and click on "Next" and click "Create Account". Bidder must enter all fields noted with * including legal company name, contact first and last name, phone number, confirm email address, password, re-enter password, select account recovery question including answer, confirm answer, select box accepting websites use terms and conditions and select security check box "I'm not a robot".

On the IMPACS Electronic Procurement System Customer Portal Home page, Bidder selects "View Event" in the Sourcing Events section.



Bidders can view event details including description, prerequisites, buyer attachments, questions and answers.

To submit a Bid, Bidder must select **"Yes, I intend to Bid"**. Bidder must complete the following sections.

Prerequisites - Bidder must complete all prerequisites.

- Bidder must upload a file of the Bid Security/Bond for 5% of total Bid Amount and certify that if they are awarded the construction contract they will enter into the contract at the Bid Amount submitted.

- Bidder must upload the completed and signed Bid Form.
  NOTE: Bids are to be entered on the Bid Form only; not in the IMPACS. As a result, IMPACS will display a bid amount of $0.

Questions - Bidder must complete all questions.

Review & Submit - Bidder must select the certification box certifying that the statements and information in response are true and correct to the best of their knowledge and belief.

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SECTION 00 2113.02

SAMPLE

ACORD

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY): xx/xx/xxxx

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER Agent's Name Agent's Address	CONTACT NAME: Agent's Information PHONE (A/C, No, Ext): FAX (A/C, No): E-MAIL ADDRESS:
INSURED Trade Contractor's Name Trade Contractor's Mailing Address	INSURER(S) AFFORDING COVERAGE / NAIC # INSURER A: Company A(AM Best Rated A/VI or Better) — Admitted Carriers INSURER B: INSURER C: INSURER D: INSURER E: INSURER F:

COVERAGES **CERTIFICATE NUMBER:** **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS (Minimum)	
* A	COMMERCIAL GENERAL LIABILITY CLAIMS-MADE [X] OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: POLICY [X] PRO-JECT [ ] LOC OTHER:	X	X	#TBD- CGL	3/1/17	3/1/18	EACH OCCURRENCE DAMAGE TO RENTED PREMISES (Ea occurrence) MED EXP (Any one person) PERSONAL & ADV INJURY GENERAL AGGREGATE PRODUCTS - COMP/OP AGG	$ 1,000,000 $ $ $1,000,000 $2,000,000 $1,000,000 $
B	AUTOMOBILE LIABILITY [X] ANY AUTO ALL OWNED AUTOS HIRED AUTOS SCHEDULED AUTOS NON-OWNED AUTOS	X	X	#TBD-AL	3/1/17	3/1/18	COMBINED SINGLE LIMIT (Ea accident) BODILY INJURY (Per person) BODILY INJURY (Per accident) PROPERTY DAMAGE (Per accident)	$ 1,000,000 amount varies based on paragraph 10.2.2 of the ConsensusDocs 602 contract
C	UMBRELLA LIAB [X] OCCUR EXCESS LIAB [ ] CLAIMS-MADE DED RETENTION $	X	X	#TBD-UMB	3/1/17	3/1/18	EACH OCCURRENCE AGGREGATE	$10,000,000 $
D	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) Y / N [ ] If yes, describe under DESCRIPTION OF OPERATIONS below	N/A	X	#TBD-WC	3/1/17	3/1/18	[X] PER STATUTE [ ] OTH-ER E.L. EACH ACCIDENT E.L. DISEASE - EA EMPLOYEE E.L. DISEASE - POLICY LIMIT	 $500,000 $500,000 $500,000
* E	Owners Contrators Protective Liability			#TBD-OCP	3/1/17	3/1/18	*Limits equal to CGL (or) as required by owner (Note- Would be either CGL or OCP, not both)	

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

Additional Insured on a Primary & Non-Contributory basis (CGL;AL;UMB/Excess) in favor of : (Owner) Iowa Department of Administrative Services (DAS), Officers, Directors, Members, Consultants, Agents, and Employees.

Waiver of Subrogation (CGL;AL;WC/EL;UMB/Excess) in favor of: (Owner) Iowa Department of Administrative Services (DAS), Officers, Directors, Members, Consultants, Agents, and Employees.

Project XXXX.XX (Number varies by project)

CERTIFICATE HOLDER	CANCELLATION
Iowa Department of Administrative Services (DAS) 109 SE 13th Street Des Moines, IA 50319	SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS. AUTHORIZED REPRESENTATIVE Signature

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SECTION 00 3113

PRELIMINARY SCHEDULE

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Preliminary Construction Schedule
B. Schedule Durations

1.02 PRELIMINARY SCHEDULE

A. A preliminary schedule has been identified by the Owner for the implementation of the Project. Refer to the schedule following this Section for references to anticipated milestones and construction duration.
B. Each step of the Preliminary Schedule is subject to receipt of acceptable bids, Owner's decision process and date of commencement.
C. A proposed construction schedule shall be submitted by all Trade Contractors to the Construction Manager no later than 48 hours prior to the pre-construction meeting. A revised Construction Schedule will be submitted by the Construction Manager once all preliminary schedules are reviewed and approved by the Owner.
D. The final construction schedule will be established post award of bids with the cooperation of all contractors.

1.03 SCHEDULE DURATIONS

A. Anticipated Notice of Intent to Award – 06/5/2026
B. Anticipated Date of Commencement – 07/06/2026
C. Linden Building A Completion by – 01/29/2027
D. Linden Building B Completion by – 06/30/2027
E. Linden Building C Completion by – 10/29/2027
F. Linden Building D Completion by – 02/25/2028
G. Substantial Completion by – 02/25/2028

PART 2 - PRODUCTS – NOT USED

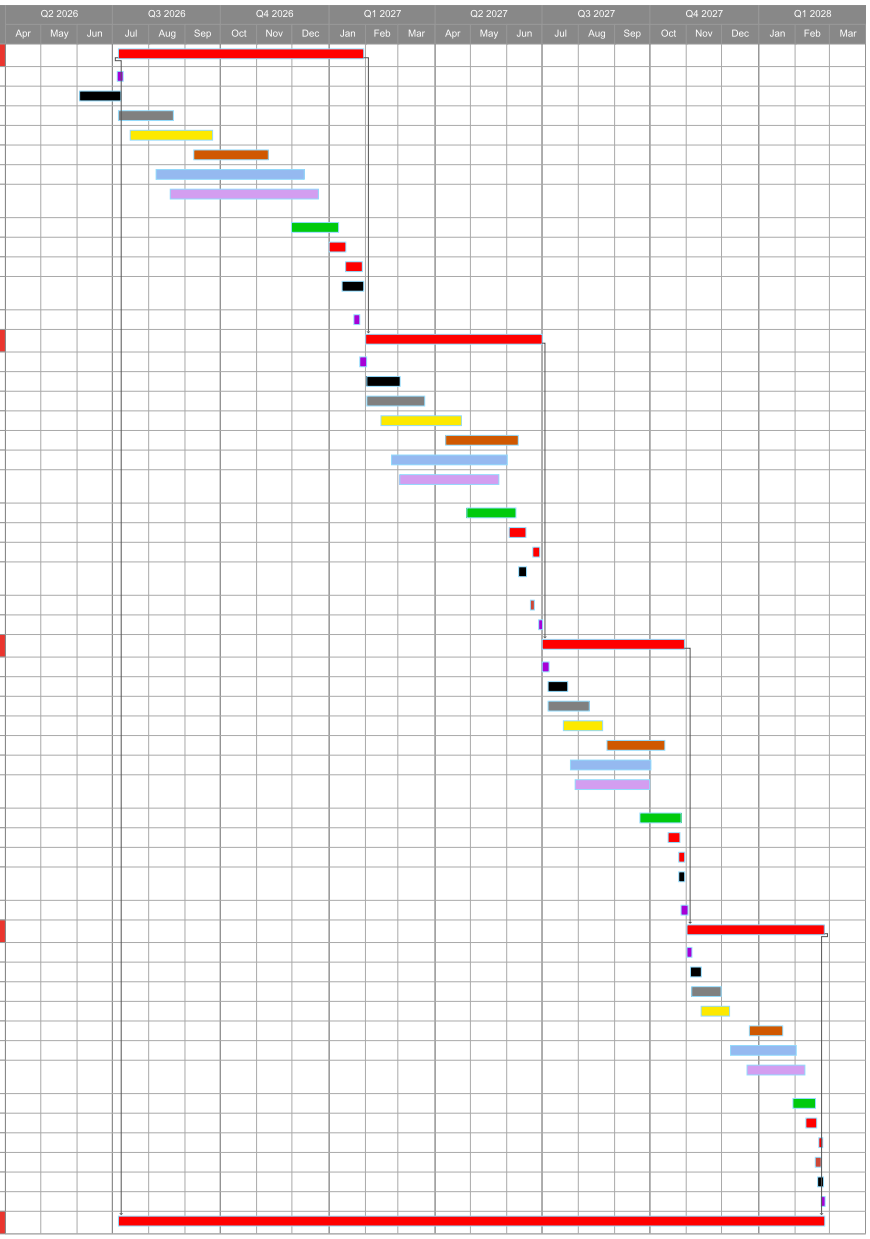
PART 3 - EXECUTION – NOT USED

END OF SECTION

9279.40&.41 BI#04 WRC Linden Court

STORY CONSTRUCTION

	Task Name	Duration	Start	Finish
1	**Building A**	**150d**	**07/06/26**	**01/29/27**
2	Owners Move Out	5d	07/05/26	07/09/26
3	Mobilization	25d	06/03/26	07/07/26
4	Abatement & Selective Demolition	35d	07/06/26	08/21/26
5	Civil & Site Improvements (concrete)	50d	07/16/26	09/23/26
6	Fire Protection System Installation	45d	09/08/26	11/09/26
7	Mechanical Systems Installation	90d	08/07/26	12/10/26
8	Electrical & Lighting & Fire Alarm Installation	90d	08/19/26	12/22/26
9	Ceilings & Architectural Restoration	30d	11/30/26	01/08/27
10	Testing, Inspections & SFM	10d	01/01/27	01/14/27
11	Punch list & Final Corrections	10d	01/15/27	01/28/27
12	Demobilization / Remobilization for next building	14d	01/12/27	01/29/27
13	Owner Move-In	3d	01/22/27	01/26/27
14	**Building B**	**108d**	**02/01/27**	**06/30/27**
15	Owners Move Out	4d	01/27/27	02/01/27
16	Mobilization	20d	02/02/27	03/01/27
17	Abatement & Selective Demolition	35d	02/02/27	03/22/27
18	Civil & Site Improvements (concrete)	50d	02/14/27	04/22/27
19	Fire Protection System Installation	45d	04/10/27	06/10/27
20	Mechanical Systems Installation	70d	02/23/27	05/31/27
21	Electrical & Lighting & Fire Alarm Installation	60d	03/02/27	05/24/27
22	Ceilings & Architectural Restoration	30d	04/28/27	06/08/27
23	Testing, Inspections & SFM	10d	06/03/27	06/16/27
24	Punch list & Final Corrections	4d	06/23/27	06/28/27
25	Demobilization / Remobilization for next building	5d	06/11/27	06/17/27
26	Fire Alarm Demo Buildings A & B	3d	06/21/27	06/23/27
27	Owner Move-In	3d	06/28/27	06/30/27
28	**Building C**	**87d**	**07/01/27**	**10/29/27**
29	Owners Move Out	4d	07/01/27	07/06/27
30	Mobilization	13d	07/06/27	07/22/27
31	Abatement & Selective Demolition	25d	07/06/27	08/09/27
32	Civil & Site Improvements (concrete)	25d	07/19/27	08/20/27
33	Fire Protection System Installation	35d	08/25/27	10/12/27
34	Mechanical Systems Installation	50d	07/25/27	09/30/27
35	Electrical & Lighting & Fire Alarm Installation	45d	07/29/27	09/29/27
36	Ceilings & Architectural Restoration	25d	09/22/27	10/26/27
37	Testing, Inspections & SFM	7d	10/16/27	10/25/27
38	Punch list & Final Corrections	5d	10/25/27	10/29/27
39	Demobilization / Remobilization for next building	5d	10/25/27	10/29/27
40	Owner Move-In	4d	10/27/27	11/01/27
41	**Building D**	**85d**	**11/01/27**	**02/25/28**
42	Owners Move Out	4d	11/01/27	11/04/27
43	Mobilization	7d	11/04/27	11/12/27
44	Abatement & Selective Demolition	17d	11/05/27	11/29/27
45	Civil & Site Improvements (concrete)	17d	11/13/27	12/06/27
46	Fire Protection System Installation	20d	12/24/27	01/20/28
47	Mechanical Systems Installation	40d	12/08/27	02/01/28
48	Electrical & Lighting & Fire Alarm Installation	35d	12/22/27	02/08/28
49	Ceilings & Architectural Restoration	15d	01/30/28	02/17/28
50	Testing, Inspections & SFM	7d	02/10/28	02/18/28
51	Punch list & Final Corrections	3d	02/21/28	02/23/28
52	Fire Alarm Demo Buildings C & D	3d	02/18/28	02/22/28
53	Demobilization	5d	02/20/28	02/24/28
54	Owner Move-In	3d	02/23/28	02/25/28
55	**Linden Court Completed**	**430d**	**07/06/26**	**02/25/28**



SECTION 00 3126

EXISTING HAZARDOUS MATERIAL INFORMATION

PART 1 - GENERAL

1.01 EXISTING HAZARDOUS MATERIAL INFORMATION

A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information, but are not a warranty of existing conditions.

B. The existing hazardous materials survey reports related to this Project, were prepared by:

1. Atlas Technical Consultants LLC
   4503 East 50th Street, Suite 800 Des Moines, IA 50317

C. Related Requirements:

1. Section 3.12 “Hazardous Materials” in the ConsensusDocs 802 contract for notification requirements if materials suspected of containing hazardous materials are encountered.

2. Atlas Survey Reports for Hazardous Building Materials dated 12/30/2025

   a. 204BS09286 – Buildings A & B

   b. 204BS09286 – Buildings C & D

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION

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HAZARDOUS BUILDING MATERIALS SURVEY – REVISED

PREPARED FOR:

Iowa Department of Administrative Services
109 SE 13th Street
Des Moines, Iowa 50319

PROJECT LOCATION:

Woodward Resource Center – Phase 4 Decentralization Project #9279
Linden Court Buildings A & B
1251 334th Street
Woodward, Iowa

Project Dates: October 2, 4, September 27, November 20, 2024 and December 12 and 22, 2025

Report Date: December 30, 2025

Atlas Project ID: 204BS09286

PREPARED BY:

Atlas Technical Consultants LLC
4503 East 50th Street, Suite 800
Des Moines, IA 50317

December 30, 2025

Ms. Jennifer Kleene
Iowa Department of Administrative Services
109 SE 13th Street
Des Moines, IA 50319

Re: Hazardous Building Materials Survey – Linden Court Buildings A & B – REVISED
Woodward Resource Center – Phase 4 Decentralization Project #9279
1251 334th Street
Woodward, Iowa 50276
Atlas Project Number: 204BS09286

Atlas is pleased to submit the attached Hazardous Building Materials Survey Report for the above-referenced site. This report includes procedures, methodologies and analytical laboratory results.

Atlas appreciates the opportunity to perform these services for the Iowa Department of Administrative Services (IDAS), and we look forward to working with you in the future. If you need any assistance with the implementation of the recommendations contained in this report, please feel free to give us a call at (515) 981-4528 and we will respond promptly to your needs.

Sincerely,

ATLAS TECHNICAL CONSULTANTS LLC

Chris Nicolet
Iowa Inspector

Phillip Thomas, OHST
Senior Project Manager

T A B L E O F C O N T E N T S

LETTER OF TRANSMITTAL i

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APPENDICES

APPENDIX A: Asbestos Analytical Report and Chain of Custody

APPENDIX B: Lead Analytical Report and Chain of Custody

APPENDIX C: Drawings with Sample Locations

APPENDIX D: Asbestos and Lead Paint Photo Logs

APPENDIX E: Inspector Accreditations

HAZARDOUS BUILDING MATERIALS SURVEY REPORT – REVISED

Woodward Resource Center – Linden Court Buildings A & B
Phase 4 Decentralization Project #9279
1251 334th Street
Woodward, Iowa
Atlas Project Number: 204BS09286

1.0 SCOPE OF SERVICES

The purpose of this project was to perform a survey to identify hazardous building materials (HBM) at the above-referenced property.

Atlas provided a representative asbestos survey in accordance with the referenced agreement and as outlined below:

1. Review any existing hazardous building material survey reports relating to the site, if available.
2. Identify suspect asbestos-containing materials (ACM), surface coatings potentially containing lead paint, and hazardous building materials throughout the interior and exterior of the building, not including the roof.
3. Collect and analyze bulk samples of suspect asbestos containing materials and collect paint chip samples from representative surface coatings potentially containing lead-based or lead-containing paint.
4. Provide laboratory analysis of collected samples.
5. Provide a report of findings with copies and interpretation of analytical results and identifying the locations of asbestos-containing materials, lead paint, and hazardous building materials.

2.0 GENERAL SITE CONDITIONS

The survey was conducted at the Woodward Resource Center – Linden Court Buildings A & B located at 1251 334th Street in Woodward, Iowa. The survey was limited to accessible surfaces on the interior and exterior of the building, not including the roof.

3.0 ASBESTOS SURVEY

On October 2, 4, September 27, November 20, 2024 and December 12 and 22, 2025, Linden Court Buildings A & B were inspected for ACM by inspectors Mr. Eric Brown, Chris Nicolet and Phillip Thomas of Atlas. Atlas inspectors have completed the requisite training for asbestos accreditation as inspectors at a state approved training provider under TSCA Title II.

Accessible areas were visually inspected for the presence of suspect ACM. Materials that were hidden, not accessible, or when sampled would damage the integrity of the structure, were not sampled as part of this survey. Materials visibly identified as non-asbestos (fibrous glass, foam

rubber, wood, etc.) were not sampled. The asbestos survey consisted of three basic steps: **1)** a visual inspection of the proposed work areas; **2)** a determination of homogeneous areas with suspect surfacing, thermal system insulation, and miscellaneous materials; and **3)** sampling accessible, friable and non-friable, suspect materials.

3.1 Regulation Review

The United States Environmental Protection Agency (USEPA) qualifies ACM as materials with an asbestos content greater than 1%. The following definitions are taken from Section 61.141 of Subpart M, Part 61 of Title 40: Protection of Environment of the Code of Federal Regulations (CFR).

- "Category I non-friable ACM" is defined as asbestos-containing packings, gaskets, resilient floor covering, and asphalt roofing products containing more than 1% asbestos as determined using the method specified in appendix E, subpart E, 40 CFR part 763, section 1, Polarized Light Microscopy (PLM).

- "Category II non-friable ACM" is defined as any material, excluding Category I non-friable ACM, containing more than 1% asbestos as determined using the methods specified in appendix E, subpart E, 40 CFR part 763, section 1, PLM that, when dry, ***cannot*** be crumbled, pulverized, or reduced to powder by hand pressure.

- "Friable asbestos material" is defined as any material containing more than 1% asbestos as determined using the methods specified in appendix E, subpart E, 40 CFR part 763, section 1, PLM that when dry, ***can*** be crumbled, pulverized, or reduced to powder by hand pressure. If the asbestos content is less than 10% as determined by a method other than point counting by PLM, verify the asbestos content by point counting using PLM.

3.2 Homogeneous Areas

Prior to sampling, homogeneous areas were identified in order to facilitate a sampling strategy. A homogeneous sampling area can be described as one or more areas with suspect material similar in appearance and texture that have the same installation date and function. The actual number of samples collected from each homogeneous sampling area may vary, dependent upon material type and the professional judgment of the inspector.

3.3 Sampling Strategy

The sampling strategy incorporated Asbestos Hazard Emergency Response Acts (AHERA) requirements, quantities of suspect material, and the inspector's judgment to aid in the identification of suspect asbestos-containing materials. If the analytical results indicated that all the samples collected per homogeneous area did not contain asbestos, then the homogeneous area (material) was considered non-asbestos-containing. However, if the analytical results of one or more of the samples collected per homogeneous area indicated that asbestos was present in quantities greater than one percent asbestos (as defined by EPA), all of the homogeneous area (material) was treated as an asbestos-containing material regardless of any other analytical results. Materials which were visually determined to be non-asbestos (i.e. fibrous glass, foam rubber, etc.) by the accredited inspector were not required to be sampled. Actual collection of a bulk asbestos sample involves

physically removing approximately one square inch (1 in^2) of material and placing it in an airtight sample container. Sample containers were marked with a unique identification number, which was documented in the field notes.

3.4 Laboratory Analytical Results

A total of **189** samples were collected from building materials suspected of containing asbestos. The samples were submitted under chain of custody to EMSL Analytical, Inc. (EMSL) located at 200 Route 130 North in Cinnaminson, New Jersey, for analysis by polarized light microscopy (PLM) with dispersion staining techniques per the *USEPA Method for the Determination of Asbestos in Bulk Building Materials (600/R-93-116)*. The percentage of asbestos, if applicable, was established by microscopic visual estimation. EMSL is an accredited laboratory by the National Voluntary Laboratory Accreditation Plan (NVLAP) No. 101048-0. Any material that contains greater than one percent (>1%) asbestos is considered an ACM and must be handled according to Occupational Safety and Health Administration (OSHA), USEPA, and all applicable state and local regulations.

Laboratory test results are provided in Appendix A.

3.5 Suspect Asbestos-Containing Materials

The following table contains a list of suspect ACM sampled:

TABLE 1: SUSPECT ASBESTOS MATERIALS

Material	Location	Sample Number
Ceramic Floor Tile Grout Gray	Basement B01	LA-1
2’ x 4’ Ceiling Tile	Basement B01	LA-2
CMU Grout	Basement B01	LA-3
Drywall	Basement B01B	LA-4
Drywall Mud	Basement B01B	LA-5
Duct Sealant Gray	Basement B05	LA-6
4” Cove Base Black	Basement B10	LA-7
Cove Base Mastic	Basement B10	LA-8
Sink Insulation	Basement B08	LA-9
Textured Paint	Basement B09	LA-10
Textured Paint	Basement B09	LA-11
Textured Paint	Basement B09	LA-12
Vibration Damper	Basement B04	LA-13
Drywall Tape	Basement B06	LA-14
Drywall Mud	Basement B06	LA-15
Vibration Damper	Basement B12	LA-16
4” Cove Base Gray	Basement B06	LA-17
Cove Base Mastic	Basement B06	LA-18
Terrazzo	Basement B06	LA-19
Drywall Mud	Basement B06	LA-20
Vibration Damper	Basement B16	LA-21
Ceramic Floor Tile Grout	Basement B17	LA-22
Red Sheet Flooring	Basement B32	LA-23

TABLE 1: SUSPECT ASBESTOS MATERIALS		
Material	**Location**	**Sample Number**
Red Sheet Flooring Mastic Black	Basement B32	LA-24
12” x 12” VFT	Basement B20	LA-25
VFT Mastic Tan	Basement B20	LA-26
12” x 12” VFT Darker	Basement B20	LA-27
12” x 12” VFT	Basement B33	LA-28
VFT Mastic Tan	Basement B33	LA-29
Green Sheet Flooring	Basement B28	LA-30
Sheet Flooring Mastic Tan	Basement B28	LA-31
Green Ceramic Tile Grout Gray	Basement B25	LA-32
Carpet Mastic Tan	Basement B28	LA-33
1” x 1” Ceramic Tile Grout	Basement B26	LA-34
2’ x 2’ Ceiling Tile	Basement B20	LA-35
CMU Mortar	Basement B24	LA-36
Drywall	Basement B20	LA-37
Drywall Mud	Basement B20	LA-38
Carpet Mastic	Basement B20	LA-39
Drywall Tape	Basement B20	LA-40
2’ x 2’ Ceiling Tile	Room 131	LA-41
Sheet Flooring White	Room 118	LA-42
Sheet Flooring Mastic	Room 118	LA-43
Sheet Flooring	Room 112	LA-44
Sheet Flooring Mastic	Room 112	LA-45
Caulk White	Room 131	LA-46
Caulk Brown	Room 141D	LA-47
Caulk White	Room 138	LA-48
Drywall Mud	Room 140	LA-49
Ceramic Tile Grout	Room 140	LA-50
Plaster	Room 131	LA-51
Drywall Mud	Room 137	LA-52
Vibration Damper	Room 110	LA-53
Plaster	Room 110	LA-54
2’ x 4’ Ceiling Tile	Room 110	LA-55
Drywall Mud	Room 118	LA-56
Floor Coating	Room 119	LA-57
Plaster	Room 120	LA-58
Terrazzo	Room 120	LA-59
Caulk Gray	Room 120	LA-60
Window Glazing	Room 220	LA-61
Vibration Damper	Room 201	LA-62
Sheet Flooring	Room 214	LA-63
Sheet Floor Mastic	Room 214	LA-64
Dark Sheet Flooring	Room 216	LA-65
Sheet Flooring Mastic	Room 216	LA-66
Sink Insulation Black	Room 216	LA-67
Red Floor Tile Grout	Room 216	LA-68

TABLE 1: SUSPECT ASBESTOS MATERIALS		
Material	**Location**	**Sample Number**
Cream Sheet Flooring	Room 210	LA-69
Sheet Flooring Mastic	Room 210	LA-70
Caulk Clear	Room 206	LA-71
Caulk White	Room 205	LA-72
Yellow Brick Mortar	Room 207 Pipe Chase	LA-73
Pink Ceramic Floor Tile Grout	Room 207	LA-74
Plaster	Room 207	LA-75
Caulk Off-White	Room 208	LA-76
6” Cove Base Black	Room 208	LA-77
Cove Base Mastic	Room 208	LA-78
Drywall Mud	Room 208	LA-79
Caulk White	Room 208	LA-80
Drywall Mud	Room 214	LA-81
Window Glazing	Room 214	LA-82
Plaster	Room 214	LA-83
Drywall	Room 213	LA-84
Faux Wood Floor Coating	Room 214	LA-85
2’ x 4’ Ceiling Tile	Room 214	LA-86
Yellow Brick Mortar	Room 237 Pipe Chase	LA-87
Pink Ceramic Tile Grout	Room 237	LA-88
Plaster	Room 237	LA-89
Terrazzo	Room 228	LA-90
Caulk White	Room 236	LA-91
Green Ceramic Floor Tile Grout	Room 236	LA-92
TSI Elbow Light Gray	Room 235 Pipe Chase	LA-93
TSI Elbow Large Diameter	Room 235 Pipe Chase	LA-94
Red Ceramic Floor Tile Grout	Room 229	LA-95
Vibration Damper	Room 230	LA-96
Plaster	Room 230	LA-97
2’ x 2’ Ceiling Tile	Room 229	LA-98
Drywall	Room 238	LA-99
TSI Steam Run	Basement B06	LA-100
TSI Steam Run	Basement B01	LA-101
TSI Steam Run	Basement B02	LA-102
TSI Steam Elbow	Basement B06	LA-103
TSI Steam Elbow	Basement B10	LA-104
TSI Steam Elbow	Basement B02	LA-105
TSI Hot Water Run	Basement B06	LA-106
TSI Hot Water Run	Basement B06	LA-107
TSI Hot Water Run	Basement B06	LA-108
TSI Hot Water Elbow	Basement B06	LA-109
TSI Hot Water Elbow	Basement B06	LA-110
TSI Hot Water Elbow	Basement B06	LA-111
TSI Cold Water Run	Basement B06	LA-112
TSI Cold Water Run	Basement B06	LA-113

TABLE 1: SUSPECT ASBESTOS MATERIALS		
Material	**Location**	**Sample Number**
TSI Cold Water Run	Basement B06	LA-114
TSI Cold Water Elbow	Basement B06	LA-115
TSI Cold Water Elbow	Basement B06	LA-116
TSI Cold Water Elbow	Basement B06	LA-117
TSI Circulating Water Run	Basement B06	LA-118
TSI Circulating Water Run	Basement B06	LA-119
TSI Circulating Water Run	Basement B06	LA-120
TSI Circulating Water Elbow	Basement B06	LA-121
TSI Circulating Water Elbow	Basement B06	LA-122
TSI Circulating Water Elbow	Basement B06	LA-123
TSI Steam Run	Basement B20	LA-124
TSI Steam Run	Basement B23	LA-125
TSI Steam Run	Basement B33	LA-126
TSI Steam Elbow	Basement B20	LA-127
TSI Steam Elbow	Basement B23	LA-128
TSI Steam Elbow	Basement B33	LA-129
TSI Hot Water Run	Basement B20	LA-130
TSI Hot Water Run	Basement B20	LA-131
TSI Hot Water Run	Basement B20	LA-132
TSI Hot Water Elbow	Basement B20	LA-133
TSI Hot Water Elbow	Basement B20	LA-134
TSI Hot Water Elbow	Basement B20	LA-135
TSI Cold Water Run	Basement B20	LA-136
TSI Cold Water Run	Basement B20	LA-137
TSI Cold Water Run	Basement B20	LA-138
TSI Cold Water Elbow	Basement B20	LA-139
TSI Cold Water Elbow	Basement B20	LA-140
TSI Cold Water Elbow	Basement B20	LA-141
TSI Circulation Water Run	Basement B20	LA-142
TSI Circulation Water Run	Basement B20	LA-143
TSI Circulation Water Run	Basement B20	LA-144
TSI Circulation Water Elbow	Basement B20	LA-145
TSI Circulation Water Elbow	Basement B20	LA-146
TSI Circulation Water Elbow	Basement B20	LA-147
HVAC Duct Insulation (interior of ducts)	Basement B12	LA-148
Acoustical Texture Ceiling	Linden A, 2nd Floor – Kitchen	LA-149-Plaster
Plaster	Linden A, 2nd Floor – Kitchen	LA-149-Plaster 2
Acoustical Texture Ceiling	Linden A, 2nd Floor – Room 218	LA-150-Plaster
Plaster	Linden A, 2nd Floor – Room 218	LA-150-Plaster 2
Acoustical Texture Ceiling	Linden A, 2nd Floor –Corridor 220	LA-151-Plaster
Plaster	Linden A, 2nd Floor –Corridor 220	LA-151-Plaster 2
Acoustical Texture Ceiling	Linden A/B, 1st Floor – South Main Corridor	LA-152-Plaster
Plaster	Linden A/B, 1st Floor – South Main Corridor	LA-152-Plaster 2

The following table is a summary of the suspect asbestos-containing materials that have been determined, through laboratory analysis, to contain asbestos greater than one percent (>1%):

TABLE 2: ASBESTOS-CONTAINING MATERIALS

Sample Number	Material	Location	Approx. Quantity	Asbestos Content
LA-9	Sink Insulation (purple)	Basement B08	1 double sink	8% Chrysotile
LA-24	Red Sheet Flooring Mastic Black	Basement B32	160 SF	13% Chrysotile
LA-29	VFT Mastic Tan	Basement B33	350 SF	6% Chrysotile
LA-30	Green Sheet Flooring	Basement B28	300 SF	22% Chrysotile
LA-31	Sheet Flooring Mastic Tan	Basement B28		7% Chrysotile
LA-43	Sheet Flooring Mastic	Room 118	3,800 SF	2% Anthophyllite
LA-45	Sheet Flooring Mastic	Room 112		3% Anthophyllite
LA-51	Plaster – base coat	Room 131	2,000 SF	6% Chrysotile
LA-58	Plaster – fiber insulation associated with plaster	Room 120		6% Chrysotile
LA-64	Sheet Floor Mastic	Room 214	2,000 SF	2% Anthophyllite
LA-66	Sheet Flooring Mastic	Room 216		3% Anthophyllite
LA-80	Caulk White	Room 208 (where glazed block meets drywall at sink)	8 LF	<1% Anthophyllite
LA-82	Window Glazing	Room 214	64 Windows	2% Chrysotile
LA-121, 122, 123	TSI Circulation Water Elbows	A Wing Basement – Throughout	30 MF	33%-40% Chrysotile
LA-145, 146, 147	TSI Circulation Water Elbows	B Wing Basement B20 – Throughout		36%-40% Chrysotile
LC-89, 121	TSI – Sealant (white)	Basement, Mechanical B12, B21, 110, 132, 202, 230	100 SF	3 – 5% Chrysotile
LA-149, 150, 151, 152	Acoustical Texture Ceiling and Plaster Coat on Wire Lath	Linden Buildings A and B, **1st and 2nd Floors – Throughout** (above drop ceilings in many locations and assumed above drywall ceilings where height of room or corridor is reduced)	TBD	6-8% Acoustical <1% Plaster Chrysotile

SF = Square Feet, LF = Linear Feet; MF = Mechanical Fitting

4.0 LEAD PAINT CHIP TESTING

Atlas collected paint chip samples from representative surface coatings that may be impacted by renovation activities.

Surface coatings that were collected were considered to be representative of materials in a homogeneous area if:

1. They exhibited similar physical characteristics (suspect materials alike in appearance, substrate, color, and time of application were tested as homogenous areas)
2. The application of the tested surface could be associated to an application of an unsampled surface.

Atlas collected and submitted a total of **11** paint chip samples from surface coatings. The samples were submitted to EMSL of Cinnaminson, New Jersey, under proper chain of custody for analysis by Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B). EMSL is accredited under the American Industrial Hygiene Association-Laboratory Accreditation Program (AIHA-LAP, LLC) (AIHA-LAP; lab code 100194). A copy of the analytical results and chain of custody can be found in Appendix B.

The USEPA has defined LBP as *"paint or other surface coatings that contain lead in excess of 0.5 percent by weight (>0.5%)".* Results less than 0.5% by weight indicate that lead is not present at or above the USEPA regulatory level; however, lead was present in lower concentrations above the laboratory detection limit in other surfaces tested and these are classified as lead-containing paint (LCP). Negative results do not mean that lead is not present.

4.1 Inspection

The disturbance and disposal of materials with surface coatings that contain lead paint are regulated by the USEPA, OSHA and the State of Iowa. The Resource Conservation and Recovery Act (RCRA) provides the USEPA with the authority to regulate the waste status of demolition or renovation debris, including lead-containing materials. Specific notification and testing requirements must be addressed prior to transporting, treating, storing, or disposing of hazardous wastes.
Construction work covered by 29 CFR 1926.62 includes any repair, renovation or other activities that disturb in-place, lead-containing materials, but does not include routine cleaning and repainting where there is insignificant damage, wear or corrosion of existing lead-containing coatings or substrates. Unless adequately protected, employee exposures to lead must not exceed airborne concentrations >50 micrograms per cubic meter ($\mu g/m^3$) averaged over an 8-hour period.

Occupational exposure to lead occurring in the course of construction work, including maintenance activities, painting, alteration and repairs is subject to the OSHA Lead standard (29 CFR 1926.62). The lead standard applies to any detectable concentration of lead in paint, as even small concentrations of lead can result in unacceptable employee exposures depending upon the method of removal and other workplace conditions.

The disposal of lead-based paint waste, as well as paint waste containing other heavy metals, is regulated by the USEPA and State of Iowa. Wastes generated by industrial businesses, commercial businesses, and government institutions are subject to regulation. Commercial business owners and removal contractors are required to determine if paint waste generated from nonresidential structures (such as public and commercial buildings, warehouses, bridges, water towers, and transmission towers) contains heavy metals that would cause the debris to be considered a hazardous waste. Disposal options and applicable management requirements for collected debris will be based upon whether the waste stream is considered a hazardous waste and the amount of debris generated. Removal contractors and building owners need to include these factors when preparing and responding to bid specifications. Specific notification and testing requirements must be addressed prior to transporting, treating, storing, or disposing of hazardous wastes. Lead-containing wastes are considered hazardous waste under RCRA if Toxicity Characteristic Leachate Procedure (TCLP) results exceed 5 milligrams per liter (mg/L). The USEPA has made exceptions for the handling and disposal of lead wastes generated from residential housing.

Specific notification and testing requirements must be addressed prior to transporting, treating, storing, or disposing of hazardous wastes. Lead-containing wastes are considered hazardous waste under RCRA if Toxicity Characteristic Leachate Procedure (TCLP) results exceed 5 milligrams per liter (mg/L). The USEPA has made exceptions for the handling and disposal of lead wastes generated from residential housing.

The above overview is not intended to be inclusive of all potentially pertinent regulatory information. The relevant USEPA, OSHA and State of Iowa regulations should be consulted prior to undertaking activities involving the demolition, renovation or maintenance of surface coatings that contain lead.

4.2 Lead Paint Testing

The following surface coatings were collected as part of the lead paint testing:

TABLE 3: LEAD PAINT SUMMARY

Sample Number	Sample Location	Representative Material	Paint Color	Lead Concentration (% by weight)
PCLA-1	Basement B01	Concrete	White	0.032%
PCLA-2	Basement B01	Concrete	Light Blue	0.011%
PCLA-3	Basement B01	Concrete	Light Green	0.065%
PCLA-4	Basement B10	Concrete	Light Peach	<0.008
PCLA-5	1st Floor B126	Brick	Green	<0.008
PCLA-6	1st Floor B138	Brick	Light Blue	<0.008
PCLA-7	2nd Floor Room 220	Metal	Black	0.18%
PCLA-8	2nd Floor Room 216	Metal	Gray	<0.008

TABLE 3: LEAD PAINT SUMMARY				
Sample Number	Sample Location	Representative Material	Paint Color	Lead Concentration (% by weight)
PCLA-9	2nd Floor Room 216	Metal	White	<0.008
PCLA-10	Room 210	Plaster	White	0.076%
PCLA-11	2nd Floor Room 219	Drywall	Black	<0.008

bolded = lead-based paint

This evaluation report can help the Owner develop a plan for renovating the building by having concentrations of lead in the paint identified. It is our understanding that the information in this report will be provided to the contractors so that appropriate precautions can be made to minimize worker exposure to lead. If surface coatings with lead containing paint are handled improperly, exposure could occur to workers and future occupants of the facility.

5.0 HAZARDOUS MATERIALS ASSESSMENT

Atlas completed a visual inspection of rooms / areas throughout the intended work areas in an attempt to identify hazardous wastes or universal wastes that may be impacted by planned renovation activities. The survey included a visual inspection of: light fixtures and other equipment for the presence of Polychlorinated Biphenyls (PCBs); light bulbs, thermostats, switches, and other equipment for the presence of mercury; refrigerants, batteries, and devices with potential radioactive materials.

TABLE4: HAZARDOUS BUILDING MATERIALS		
Category	Material	Estimated Quantity
Batteries	Lead Acid	NA
	Nickel Cadmium	24 (exit signs)
	Lithium-Ion	NA
Mercury	Thermostats	NA
	Fluorescent Light Tubes	920
	High Intensity Discharge Bulbs	NA
	Strobes	NA
Poly-Chlorinated Biphenyl (PCBs)	Light Ballasts	230
	Transformers	3
Low Level Radioactive Sources (LLR)	Tritium Exit Signs	NA
	Smoke Detectors	124
Chlorofluorocarbons (CFCs) or	Refrigerator/Cooler	NA

TABLE 4: HAZARDOUS BUILDING MATERIALS		
Category	**Material**	**Estimated Quantity**
Hydro Chlorofluorocarbons (HCFCs)	Freezer	NA
	Water Fountain	NA

Hazardous materials or universal wastes identified in Table 4 that will be impacted by renovation activities shall be removed as part of the renovation contractor's scope of work and disposed of according to USEPA Toxic Substances Control Act (TSCA) and the State of Iowa regulations.

6.0 CONCLUSIONS

6.1 Asbestos

The NESHAP and OSHA regulations govern the removal of ACM. Atlas recommends that a State of Iowa certified abatement contractor be retained to properly abate and dispose of ACM identified in Table 1 above and in accordance with local, state, and federal regulations.

The owner and/or operator are responsible for NESHAP regulatory compliance regarding the proper removal, handling, and disposal of ACM containing >1% asbestos prior to renovation or demolition. Also, per state regulations, please be aware that the owner and/or operator must submit a notification to the Iowa Department of Natural Resources (IDNR) 10 business days prior to asbestos abatement at certain quantity thresholds and prior to renovation/demolition activities.

6.2 Lead

Lead was identified above the laboratory detection limit in five of the 11 surface coatings tested.

Contractors should use caution during construction-related activities as concealed surface coatings containing lead-based paints that were not previously tested may be encountered. If materials not sampled during this investigation are later identified to contain regulated quantities of lead concentrations, then they should be removed, controlled and/or disposed of in accordance with federal, state and local regulations, prior to disturbance. OSHA considers any detectable level of lead as LCP and disturbance of these surface coatings is subject to the training and work practices in OSHA 29 CFR 1926.62 "Lead in Construction".

6.3 Hazardous Building Materials

Hazardous materials or universal wastes identified in Table 4 that will be impacted by renovation activities shall be removed as part of the renovation contractor's scope of work and disposed of according to USEPA Toxic Substances Control Act (TSCA) and the State of Iowa regulations.

7.0 ASSUMPTIONS AND LIMITATIONS

The results, findings, conclusions, and recommendations expressed in this report are based

solely on conditions noted during the September 27, 28, November 20, 2024 and December 12 and 22, 2025, Atlas HBM survey of Linden Court Buildings A & B located on the Woodward Resource Center Campus in Woodward, Iowa.

Atlas did not perform destructive sampling -- it was not within Atlas's scope of work to remove surface materials to investigate portions of the structure or materials that may lay beneath the surface -- thus, any materials that could not be visually identified on the surface were not inspected and would not be noted in this report. Atlas's selection of sample locations and frequency of sampling was based on the inspector's assumption that like materials in the same area are homogeneous in content.

The report is designed to aid the building owner, architect, construction manager, general contractor, and potential abatement contractor in locating hazardous building materials. Under no circumstances is the report to be utilized as a bidding document or as a project specification document since it does not have all the components required to serve as a Project Design document or an Abatement Work plan.

Our professional services have been performed, our findings obtained, and our conclusions and recommendations prepared in accordance with customary principles and practices in the fields of environmental science and engineering. This statement is in lieu of other statements either expressed or implied. This report does not warrant against future operations or conditions, nor does it warrant against operations or conditions present of a type or at a location not investigated.

This report is intended for the sole use of IDAS. The scope of services performed in execution of this evaluation may not be appropriate to satisfy the needs of other users, and use or re-use of this document or the findings, conclusions, or recommendations is at the risk of said user.

Atlas recommendations are based in part on federal, state, local regulations, and guidelines. Atlas does not undertake responsibility for reporting to any local, state, or federal public agencies of conditions at the site that may present a potential danger to public health or safety. Atlas recommends that the Client comply with regulations and response actions in accordance with federal, state, and local regulations.

APPENDIX A

ASBESTOS ANALYTICAL RESULTS AND CHAIN OF CUSTODY

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Analysis Date: 10/08/2024
Collected Date: 09/27/2024

Project: 204BS07475 / Woodward Tunnel Survey / Linden A & B

Test Report: Asbestos Analysis of Bulk Materials via AHERA Method 40CFR 763 Subpart E Appendix E supplemented with EPA 600/R-93/116 using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
LA-1 *042420683-0001*	Basement - B01 - Dark Gray Ceramic Floor Tile Grout	Gray Non-Fibrous Homogeneous		50% Quartz 30% Ca Carbonate 20% Non-fibrous (Other)	None Detected
LA-2 *042420683-0002*	Basement - B01 - 2'x4' Ceiling Tile	Gray Fibrous Homogeneous	25% Cellulose 25% Min. Wool	30% Ca Carbonate 20% Non-fibrous (Other)	None Detected
LA-3 *042420683-0003*	Basement - B01 - CMU Grout	Gray Non-Fibrous Homogeneous		50% Quartz 35% Ca Carbonate 15% Non-fibrous (Other)	None Detected
LA-4 *042420683-0004*	Basement - B01B - Drywall	Brown/Gray Fibrous Heterogeneous	5% Cellulose	10% Ca Carbonate 70% Gypsum 15% Non-fibrous (Other)	None Detected
LA-5 *042420683-0005*	Basement - B01B - Drywall Mud	White Non-Fibrous Homogeneous		80% Ca Carbonate 5% Mica 15% Non-fibrous (Other)	None Detected
LA-6 *042420683-0006*	Basement - B05 - Gray Duct Sealant	Gray Non-Fibrous Homogeneous		90% Matrix 10% Non-fibrous (Other)	None Detected
LA-7 *042420683-0007*	Basement - B10 - 4" Black Cove Base	Black Non-Fibrous Homogeneous		70% Matrix 30% Non-fibrous (Other)	None Detected
LA-8 *042420683-0008*	Basement - B10 - Cove Base Mastic	Brown Non-Fibrous Homogeneous		20% Ca Carbonate 70% Matrix 10% Non-fibrous (Other)	None Detected
LA-9 *042420683-0009*	Basement - B08 - Sink Insulation	Purple Non-Fibrous Homogeneous		60% Ca Carbonate 32% Non-fibrous (Other)	**8% Chrysotile**
LA-10 *042420683-0010*	Basement - B09 - Textured Paint	Tan/White Non-Fibrous Homogeneous		75% Ca Carbonate 10% Mica 15% Non-fibrous (Other)	None Detected
LA-11 *042420683-0011*	Basement - B09 - Textured Paint	White Non-Fibrous Homogeneous		65% Ca Carbonate 10% Mica 25% Non-fibrous (Other)	None Detected
LA-12 *042420683-0012*	Basement - B09 - Textured Paint	White Non-Fibrous Homogeneous		70% Ca Carbonate 10% Mica 20% Non-fibrous (Other)	None Detected
LA-13 *042420683-0013*	Basement - B04 - Vibration Damper	Brown/Gray Fibrous Homogeneous	60% Cellulose	40% Non-fibrous (Other)	None Detected
LA-14 *042420683-0014*	Basement - B06 - Drywall Tape	Beige Fibrous Homogeneous	90% Cellulose	10% Non-fibrous (Other)	None Detected
LA-15 *042420683-0015*	Basement - B06 - Drywall Mud	White Non-Fibrous Homogeneous		85% Ca Carbonate 5% Mica 10% Non-fibrous (Other)	None Detected
LA-16 *042420683-0016*	Basement - B12 - Vibration Damper	Brown Fibrous Heterogeneous	20% Cellulose	10% Quartz 50% Ca Carbonate 20% Non-fibrous (Other)	None Detected

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Test Report: Asbestos Analysis of Bulk Materials via AHERA Method 40CFR 763 Subpart E Appendix E supplemented with EPA 600/R-93/116 using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
LA-17 *042420683-0017*	Basement - B06 - 4" Gray Cove Base	Black Non-Fibrous Homogeneous		91% Matrix 9% Non-fibrous (Other)	None Detected
LA-18 *042420683-0018*	Basement - B06 - Cove Base Mastic	Tan Non-Fibrous Homogeneous		20% Ca Carbonate 65% Matrix 15% Non-fibrous (Other)	None Detected
LA-19 *042420683-0019*	Basement - B06 Stairs - Terrazzo	Brown/Gray Non-Fibrous Homogeneous		60% Quartz 25% Ca Carbonate 15% Non-fibrous (Other)	None Detected
LA-20 *042420683-0020*	Basement - B06 - Drywall Mud	White Non-Fibrous Homogeneous		82% Ca Carbonate 6% Mica 12% Non-fibrous (Other)	None Detected
LA-21 *042420683-0021*	Basement - B16 - Vibration Damper	Brown Fibrous Homogeneous	87% Cellulose	13% Non-fibrous (Other)	None Detected
LA-22 *042420683-0022*	Basement - B17 - Ceramic Floor Tile Grout	Gray Non-Fibrous Homogeneous		59% Quartz 30% Ca Carbonate 11% Non-fibrous (Other)	None Detected
LA-23 *042420683-0023*	Basement - B32 - Red Sheet Flooring	Red Non-Fibrous Heterogeneous	10% Cellulose	50% Matrix 40% Non-fibrous (Other)	None Detected
LA-24 *042420683-0024*	Basement - B32 - Black Sheet Flooring Mastic	Black Non-Fibrous Homogeneous		80% Matrix 7% Non-fibrous (Other)	**13% Chrysotile**
LA-25 *042420683-0025*	Basement - B20 - 12"x12" VFT	Tan Non-Fibrous Homogeneous		62% Ca Carbonate 38% Non-fibrous (Other)	None Detected
LA-26 *042420683-0026*	Basement - B20 - Tan VFT Mastic	Tan/Yellow Non-Fibrous Homogeneous		33% Ca Carbonate 40% Matrix 27% Non-fibrous (Other)	None Detected
LA-27 *042420683-0027*	Basement - B20 - Darker 12"x12" VFT	Tan/White Non-Fibrous Homogeneous		65% Ca Carbonate 35% Non-fibrous (Other)	None Detected
LA-28 *042420683-0028*	Basement - B33 - 12"x12" VFT	Tan Non-Fibrous Homogeneous		62% Ca Carbonate 38% Non-fibrous (Other)	None Detected
LA-29 *042420683-0029*	Basement - B33 - VFT Mastic	Black Non-Fibrous Homogeneous		30% Ca Carbonate 45% Matrix 19% Non-fibrous (Other)	**6% Chrysotile**
LA-30 *042420683-0030*	Basement - B28 - Green Sheet Flooring	Tan/Green Fibrous Homogeneous	15% Cellulose	30% Ca Carbonate 22% Matrix 11% Non-fibrous (Other)	**22% Chrysotile**
LA-31 *042420683-0031*	Basement - B28 - Tan Mastic Sheet Flooring	Tan Non-Fibrous Homogeneous		30% Ca Carbonate 40% Matrix 23% Non-fibrous (Other)	**7% Chrysotile**
LA-32 *042420683-0032*	Basement - B25 Restroom - Green Ceramic Tile Gray Grout	Gray Non-Fibrous Homogeneous	3% Cellulose	55% Quartz 30% Ca Carbonate 12% Non-fibrous (Other)	None Detected
LA-33 *042420683-0033*	Basement - B28 - Tan Carpet Mastic	Tan/Yellow Non-Fibrous Homogeneous	3% Cellulose	33% Ca Carbonate 40% Matrix 24% Non-fibrous (Other)	None Detected
LA-34 *042420683-0034*	Basement - B26 - 1"x1" Ceramic Tile Grout	Gray Non-Fibrous Homogeneous	3% Cellulose	55% Quartz 30% Ca Carbonate 12% Non-fibrous (Other)	None Detected
LA-35 *042420683-0035*	Basement - B20 - 2'x2' Ceiling Tile	Tan/White Fibrous Homogeneous	33% Cellulose 20% Min. Wool	12% Ca Carbonate 15% Perlite 20% Non-fibrous (Other)	None Detected

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Test Report: Asbestos Analysis of Bulk Materials via AHERA Method 40CFR 763 Subpart E Appendix E supplemented with EPA 600/R-93/116 using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
LA-36 *042420683-0036*	Basement - B24 - CMU Mortar	Gray Non-Fibrous Homogeneous	3% Cellulose	55% Quartz 30% Ca Carbonate 12% Non-fibrous (Other)	None Detected
LA-37 *042420683-0037*	Basement - B20 - Drywall	Brown/Tan Non-Fibrous Homogeneous	8% Cellulose	12% Ca Carbonate 70% Gypsum 10% Non-fibrous (Other)	None Detected
LA-38 *042420683-0038*	Basement - B20 - Drywall Mud	White Non-Fibrous Homogeneous		74% Ca Carbonate 8% Mica 18% Non-fibrous (Other)	None Detected
LA-39 *042420683-0039*	Basement - B20 - Carpet Mastic	Gray/Tan Non-Fibrous Heterogeneous		35% Ca Carbonate 45% Matrix 20% Non-fibrous (Other)	None Detected
LA-40 *042420683-0040*	Basement - B20 - Drywall Tape	Tan/White Non-Fibrous Homogeneous	70% Cellulose	12% Ca Carbonate 4% Mica 14% Non-fibrous (Other)	None Detected
LA-41 *042420683-0041*	Floor 1 - 131 - 2'x2' Ceiling Tile	Tan/White Fibrous Homogeneous	35% Cellulose 22% Min. Wool	10% Ca Carbonate 18% Perlite 15% Non-fibrous (Other)	None Detected
LA-42 *042420683-0042*	Floor 1 - 118 - White Sheet Flooring	White Non-Fibrous Homogeneous		10% Ca Carbonate 60% Matrix 30% Non-fibrous (Other)	None Detected
LA-43 *042420683-0043*	Floor 1 - 118 - Sheet Flooring Mastic	Tan/White Non-Fibrous Homogeneous		25% Ca Carbonate 40% Matrix 33% Non-fibrous (Other)	**2% Anthophyllite**
LA-44 *042420683-0044*	Floor 1 - 112 - Sheet Flooring	Brown/Tan Non-Fibrous Homogeneous		33% Ca Carbonate 48% Matrix 19% Non-fibrous (Other)	None Detected
LA-45 *042420683-0045*	Floor 1 - 112 - Sheet Flooring Mastic	Tan Non-Fibrous Homogeneous		30% Ca Carbonate 40% Matrix 27% Non-fibrous (Other)	**3% Anthophyllite**
LA-46 *042420683-0046*	Floor 1 - 131 - White Caulk	White Non-Fibrous Homogeneous		35% Ca Carbonate 5% Mica 40% Matrix 20% Non-fibrous (Other)	None Detected
LA-47 *042420683-0047*	Floor 1 - 141D - Brown Caulk	Brown Non-Fibrous Homogeneous		25% Ca Carbonate 50% Matrix 25% Non-fibrous (Other)	None Detected
LA-48 *042420683-0048*	Floor 1 - 138 - White Caulk	White Non-Fibrous Homogeneous		33% Ca Carbonate 4% Mica 40% Matrix 23% Non-fibrous (Other)	None Detected
LA-49 *042420683-0049*	Floor 1 - 140 - Drywall Mud	Tan/White Non-Fibrous Heterogeneous	3% Cellulose	74% Ca Carbonate 8% Mica 15% Non-fibrous (Other)	None Detected
LA-50 *042420683-0050*	Floor 1 - 140 - Ceramic Tile Grout	Gray/Tan Non-Fibrous Homogeneous	3% Cellulose	12% Quartz 50% Ca Carbonate 35% Non-fibrous (Other)	None Detected
LA-51-Skim Coat *042420683-0051*	Floor 1 - 131 - Plaster	White Non-Fibrous Homogeneous		33% Ca Carbonate 40% Gypsum 15% Perlite 12% Non-fibrous (Other)	None Detected
LA-51-Base Coat *042420683-0051A*	Floor 1 - 131 - Plaster	Tan Non-Fibrous Homogeneous		22% Ca Carbonate 35% Gypsum 15% Perlite 22% Non-fibrous (Other)	**6% Chrysotile**
LA-52 *042420683-0052*	Floor 1 - 137 - Drywall Mud	White Non-Fibrous Homogeneous	4% Cellulose	60% Ca Carbonate 8% Mica 28% Non-fibrous (Other)	None Detected

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			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
LA-53 *042420683-0053*	Floor 1 - 110 - Vibration Damper	Brown Fibrous Homogeneous	78% Cellulose	10% Ca Carbonate 12% Non-fibrous (Other)	None Detected
LA-54-Skim Coat *042420683-0054*	Floor 1 - 110 - Plaster	White Non-Fibrous Homogeneous		30% Ca Carbonate 55% Gypsum 15% Non-fibrous (Other)	None Detected
LA-54-Base Coat *042420683-0054A*	Floor 1 - 110 - Plaster	Tan/White Non-Fibrous Homogeneous		15% Quartz 22% Ca Carbonate 40% Gypsum 10% Perlite 13% Non-fibrous (Other)	None Detected
LA-55 *042420683-0055*	Floor 1 - 110 - Ceiling Tile	Tan/White Non-Fibrous Homogeneous	40% Cellulose 21% Min. Wool	12% Ca Carbonate 15% Perlite 12% Non-fibrous (Other)	None Detected
LA-56 *042420683-0056*	Floor 1 - 118 - Drywall Mud	White Non-Fibrous Heterogeneous		70% Ca Carbonate 7% Mica 23% Non-fibrous (Other)	None Detected
LA-57 *042420683-0057*	Floor 1 - 119 - Gray Floor Coating	Gray/Tan/White Non-Fibrous Homogeneous	4% Cellulose	65% Quartz 10% Ca Carbonate 21% Non-fibrous (Other)	None Detected
LA-58-Plaster *042420683-0058*	Floor 1 - 120 - Plaster	White/Beige Non-Fibrous Heterogeneous		12% Ca Carbonate 68% Gypsum 20% Non-fibrous (Other)	None Detected
LA-58-Fiber Insulation *042420683-0058A*	Floor 1 - 120 - Plaster	White Fibrous Heterogeneous		50% Ca Carbonate 15% Perlite 29% Non-fibrous (Other)	**6% Chrysotile**
LA-59 *042420683-0059*	Floor 1 - 120 - Terrazzo Floor	Gray/Tan/Various Non-Fibrous Homogeneous		73% Quartz 15% Ca Carbonate 12% Non-fibrous (Other)	None Detected
LA-60 *042420683-0060*	Floor 1 - 120 - Gray Caulk	Gray/Tan/White Fibrous Heterogeneous	3% Cellulose	8% Quartz 60% Matrix 29% Non-fibrous (Other)	None Detected
LA-61 *042420683-0061*	Floor 2 - 220 - Lt Gray Window Glazing	Tan/White Non-Fibrous Homogeneous	<1% Cellulose 2% Wollastonite	12% Quartz 65% Matrix 21% Non-fibrous (Other)	None Detected
LA-62 *042420683-0062*	Floor 2 - 201 - Vibration Damper	Brown/Gray Fibrous Heterogeneous	65% Cellulose	20% Quartz 15% Non-fibrous (Other)	None Detected
LA-63 *042420683-0063*	Floor 2 - 214 - Sheet Floor	Brown Non-Fibrous Heterogeneous		45% Ca Carbonate 25% Matrix 30% Non-fibrous (Other)	None Detected
LA-64 *042420683-0064*	Floor 2 - 214 - Sheet Floor Mastic	Brown/Tan/White Fibrous Heterogeneous	8% Cellulose 2% Synthetic	15% Quartz 45% Matrix 28% Non-fibrous (Other)	**2% Anthophyllite**
LA-65 *042420683-0065*	Floor 2 - 216 - Dark Sheet Floor	Brown Non-Fibrous Heterogeneous		50% Ca Carbonate 20% Matrix 30% Non-fibrous (Other)	None Detected
LA-66 *042420683-0066*	Floor 2 - 216 - Dark Sheet Floor Mastic	Tan/White Non-Fibrous Heterogeneous	2% Cellulose	24% Quartz 50% Matrix 21% Non-fibrous (Other)	**3% Anthophyllite**
LA-67 *042420683-0067*	Floor 2 - 216 - Black Sink Insulation	Brown/Black Fibrous Homogeneous	2% Cellulose	68% Matrix 30% Non-fibrous (Other)	None Detected
LA-68 *042420683-0068*	Floor 2 - 216 - Red Floor Tile Grout	Brown/Gray/Tan Non-Fibrous Homogeneous	3% Cellulose	65% Quartz 15% Ca Carbonate 17% Non-fibrous (Other)	None Detected

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			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
LA-69 *042420683-0069*	Floor 2 - 210 - Cream Sheet Floor	Tan Non-Fibrous Heterogeneous		50% Ca Carbonate 20% Matrix 30% Non-fibrous (Other)	None Detected
LA-70 *042420683-0070*	Floor 2 - 210 - Cream Sheet Floor Mastic	Tan/White Non-Fibrous Heterogeneous	2% Cellulose	6% Quartz 70% Matrix 22% Non-fibrous (Other)	None Detected
LA-71 *042420683-0071*	Floor 2 - 206 - Clear Caulk	Clear Non-Fibrous Homogeneous		85% Matrix 15% Non-fibrous (Other)	None Detected
LA-72 *042420683-0072*	Floor 2 - 205 - White Caulk	White Non-Fibrous Homogeneous	2% Cellulose	12% Quartz 70% Matrix 16% Non-fibrous (Other)	None Detected
LA-73 *042420683-0073*	Floor 2 - 207 Pipe Chase - Yellow Brick Mortar	Gray/Tan Non-Fibrous Homogeneous		64% Quartz 15% Ca Carbonate 2% Mica 19% Non-fibrous (Other)	None Detected
LA-74 *042420683-0074*	Floor 2 - 207 - Pink Floor Tile	White/Pink Non-Fibrous Heterogeneous		66% Quartz 34% Non-fibrous (Other)	None Detected
LA-75-Skim Coat *042420683-0075*	Floor 2 - 207 - Plaster	White Non-Fibrous Heterogeneous		15% Ca Carbonate 42% Gypsum 43% Non-fibrous (Other)	None Detected
LA-75-Base Coat *042420683-0075A*	Floor 2 - 207 - Plaster	Gray/Tan/White Non-Fibrous Heterogeneous		66% Quartz 12% Ca Carbonate 8% Perlite 14% Non-fibrous (Other)	None Detected
LA-76 *042420683-0076*	Floor 2 - 208 - Off-White Caulk	White Non-Fibrous Heterogeneous	2% Cellulose	5% Quartz 68% Matrix 25% Non-fibrous (Other)	None Detected
LA-77 *042420683-0077*	Floor 2 - 208 - 6" Black Cove Base	Black Non-Fibrous Heterogeneous	<1% Cellulose	80% Matrix 20% Non-fibrous (Other)	None Detected
LA-78 *042420683-0078*	Floor 2 - 208 - 6" Black Cove Base Mastic	Tan Non-Fibrous Heterogeneous	2% Cellulose	6% Quartz 63% Matrix 29% Non-fibrous (Other)	None Detected
LA-79 *042420683-0079*	Floor 2 - 208 - Drywall Mud	White Non-Fibrous Heterogeneous		80% Ca Carbonate 10% Mica 10% Non-fibrous (Other)	None Detected
LA-80 *042420683-0080* *TEM Recommended*	Floor 2 - 208 - White Caulk	White Non-Fibrous Heterogeneous	2% Cellulose 2% Wollastonite	23% Quartz 55% Matrix 18% Non-fibrous (Other)	**<1% Anthophyllite**
LA-81 *042420683-0081*	Floor 2 - 214 - Drywall Mud	White Non-Fibrous Heterogeneous		82% Ca Carbonate 4% Mica 14% Non-fibrous (Other)	None Detected
LA-82 *042420683-0082*	Floor 2 - 214 - Window Glazing	Gray/Tan/White Non-Fibrous Homogeneous	<1% Cellulose	12% Quartz 55% Ca Carbonate 31% Non-fibrous (Other)	**2% Chrysotile**
LA-83-Skim Coat *042420683-0083*	Floor 2 - 214 - Wall Plaster	White Non-Fibrous Heterogeneous		15% Ca Carbonate 52% Gypsum 33% Non-fibrous (Other)	None Detected
LA-83-Base Coat *042420683-0083A*	Floor 2 - 214 - Wall Plaster	Gray/Tan/White Non-Fibrous Heterogeneous		60% Quartz 15% Ca Carbonate 7% Perlite 18% Non-fibrous (Other)	None Detected
LA-84 *042420683-0084*	Floor 2 - 213 - Drywall	Brown/White Fibrous Homogeneous	10% Cellulose	8% Ca Carbonate 68% Gypsum 14% Non-fibrous (Other)	None Detected

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			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
LA-85 *042420683-0085*	Floor 2 - 214 - Faux Wood Floor Coating	Gray/Tan Fibrous Heterogeneous	4% Cellulose	64% Quartz 10% Ca Carbonate 22% Non-fibrous (Other)	None Detected
LA-86 *042420683-0086*	Floor 2 - 214 - Ceiling Tile	Gray/White Fibrous Heterogeneous	55% Cellulose	30% Perlite 15% Non-fibrous (Other)	None Detected
LA-87 *042420683-0087*	Floor 2 - 237 Pipe Chase - Yellow Brick Mortar	Gray Non-Fibrous Homogeneous		65% Quartz 20% Ca Carbonate 15% Non-fibrous (Other)	None Detected
LA-88 *042420683-0088*	Floor 2 - 237 - Pink Tile Grout	Tan Non-Fibrous Homogeneous		65% Quartz 20% Ca Carbonate 15% Non-fibrous (Other)	None Detected
LA-89-Skim Coat *042420683-0089*	Floor 2 - 237 - Plaster	White Non-Fibrous Homogeneous		5% Ca Carbonate 90% Gypsum 5% Non-fibrous (Other)	None Detected
LA-89-Base Coat *042420683-0089A*	Floor 2 - 237 - Plaster	Gray Non-Fibrous Homogeneous		35% Quartz 10% Ca Carbonate 50% Gypsum 5% Non-fibrous (Other)	None Detected
LA-90 *042420683-0090*	Floor 2 - 228 - Terrazzo Floor	White/Red/Various Non-Fibrous Heterogeneous		85% Ca Carbonate 15% Non-fibrous (Other)	None Detected
LA-91 *042420683-0091*	Floor 2 - 236 - White Caulk	White Non-Fibrous Homogeneous		95% Matrix 5% Non-fibrous (Other)	None Detected
LA-92 *042420683-0092*	Floor 2 - 236 - Green Floor Tile Grout	Gray Non-Fibrous Homogeneous		40% Quartz 35% Ca Carbonate 25% Non-fibrous (Other)	None Detected
LA-93-Wrap *042420683-0093*	Floor 2 - 235 Pipe Chase - Light Gray TSI Elbow	White Fibrous Heterogeneous	35% Cellulose	25% Ca Carbonate 40% Non-fibrous (Other)	None Detected
LA-93-Mud *042420683-0093A*	Floor 2 - 235 Pipe Chase - Light Gray TSI Elbow	Gray Fibrous Homogeneous	40% Min. Wool	35% Ca Carbonate 25% Non-fibrous (Other)	None Detected
LA-94 *042420683-0094*	Floor 2 - 235 Pipe Chase - TSI - Straight Pipe Large Diameter Elbow	Gray/White Fibrous Heterogeneous	3% Cellulose 22% Min. Wool	35% Ca Carbonate 40% Non-fibrous (Other)	None Detected
LA-95 *042420683-0095*	Floor 2 - 229 - Red Tile Grout	Brown/Gray Non-Fibrous Heterogeneous	3% Cellulose	52% Quartz 20% Ca Carbonate 25% Non-fibrous (Other)	None Detected
LA-96 *042420683-0096*	Floor 2 - 230 - Vibration Damper	Brown/Gray Fibrous Heterogeneous	75% Cellulose	10% Ca Carbonate 15% Non-fibrous (Other)	None Detected
LA-97-Skim Coat *042420683-0097*	Floor 2 - 230 - Plaster	White Non-Fibrous Homogeneous		35% Ca Carbonate 60% Gypsum 5% Non-fibrous (Other)	None Detected
LA-97-Base Coat *042420683-0097A*	Floor 2 - 230 - Plaster	Gray/White Non-Fibrous Heterogeneous		30% Quartz 15% Ca Carbonate 50% Gypsum 5% Non-fibrous (Other)	None Detected
LA-98 *042420683-0098*	Floor 2 - 229 - Ceiling Tile	Brown/Gray/White Fibrous Heterogeneous	55% Cellulose 10% Min. Wool	25% Perlite 10% Non-fibrous (Other)	None Detected
LA-99 *042420683-0099*	Floor 2 - 238 - Drywall Mud	White/Rust Non-Fibrous Heterogeneous		35% Ca Carbonate 40% Gypsum 5% Mica 20% Non-fibrous (Other)	None Detected

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EMSL Order: 042420683
Customer ID: ATC55
Customer PO:
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via AHERA Method 40CFR 763 Subpart E Appendix E supplemented with EPA 600/R-93/116 using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
LA-100 *042420683-0100*	Basement - B06 - Steam Run	White/Yellow Fibrous Heterogeneous	5% Cellulose 65% Min. Wool	30% Non-fibrous (Other)	None Detected
LA-101 *042420683-0101*	Basement - B01 - Steam Run	White/Yellow Fibrous Heterogeneous	7% Cellulose 58% Min. Wool	35% Non-fibrous (Other)	None Detected
LA-102 *042420683-0102*	Basement - B02 - Steam Run	White/Yellow Fibrous Heterogeneous	5% Cellulose 65% Min. Wool	30% Non-fibrous (Other)	None Detected
LA-103-Wrap *042420683-0103*	Basement - B06 - Steam Elbow	Gray/White Fibrous Heterogeneous	40% Cellulose	15% Ca Carbonate 45% Non-fibrous (Other)	None Detected
LA-103-Mud *042420683-0103A*	Basement - B06 - Steam Elbow	Gray Fibrous Homogeneous	35% Min. Wool	40% Ca Carbonate 25% Non-fibrous (Other)	None Detected
LA-104-Wrap *042420683-0104*	Basement - B10 - Steam Elbow	White Fibrous Heterogeneous	45% Cellulose	10% Ca Carbonate 45% Non-fibrous (Other)	None Detected
LA-104-Mud *042420683-0104A*	Basement - B10 - Steam Elbow	Gray/White Fibrous Heterogeneous	30% Min. Wool	35% Ca Carbonate 35% Non-fibrous (Other)	None Detected
LA-105-Wrap *042420683-0105*	Basement - B02 - Steam Elbow	White Fibrous Heterogeneous	45% Cellulose	15% Ca Carbonate 40% Non-fibrous (Other)	None Detected
LA-105-Mud *042420683-0105A*	Basement - B02 - Steam Elbow	Gray/White Fibrous Heterogeneous	35% Min. Wool	35% Ca Carbonate 30% Non-fibrous (Other)	None Detected
LA-106 *042420683-0106*	Basement - B06 - Hot Water Run	White/Yellow Fibrous Heterogeneous	5% Cellulose 70% Min. Wool	25% Non-fibrous (Other)	None Detected
LA-107 *042420683-0107*	Basement - B06 - Hot Water Run	White/Yellow Fibrous Heterogeneous	7% Cellulose 53% Min. Wool	40% Non-fibrous (Other)	None Detected
LA-108 *042420683-0108*	Basement - B06 - Hot Water Run	White/Yellow Fibrous Heterogeneous	5% Cellulose 65% Min. Wool	30% Non-fibrous (Other)	None Detected
LA-109 *042420683-0109*	Basement - B06 - Hot Water Elbow	Gray/White Fibrous Heterogeneous	25% Min. Wool	40% Ca Carbonate 35% Non-fibrous (Other)	None Detected
LA-110-Wrap *042420683-0110*	Basement - B06 - Hot Water Elbow	White Fibrous Heterogeneous	30% Cellulose	10% Ca Carbonate 60% Non-fibrous (Other)	None Detected
LA-110-Mud *042420683-0110A*	Basement - B06 - Hot Water Elbow	Gray/White Fibrous Heterogeneous	25% Min. Wool	40% Ca Carbonate 35% Non-fibrous (Other)	None Detected
LA-111-Wrap *042420683-0111*	Basement - B06 - Hot Water Elbow	White Fibrous Heterogeneous	35% Cellulose	10% Ca Carbonate 55% Non-fibrous (Other)	None Detected
LA-111-Mud *042420683-0111A*	Basement - B06 - Hot Water Elbow	Gray/White Fibrous Heterogeneous	20% Min. Wool	35% Ca Carbonate 45% Non-fibrous (Other)	None Detected
LA-112 *042420683-0112*	Basement - B06 - Cold Water Run	White/Yellow Fibrous Heterogeneous	5% Cellulose 80% Min. Wool	15% Non-fibrous (Other)	None Detected
LA-113 *042420683-0113*	Basement - B06 - Cold Water Run	White/Yellow Fibrous Heterogeneous	5% Cellulose 75% Min. Wool	20% Non-fibrous (Other)	None Detected

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EMSL Order: 042420683
Customer ID: ATC55
Customer PO:
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via AHERA Method 40CFR 763 Subpart E Appendix E supplemented with EPA 600/R-93/116 using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
LA-114 *042420683-0114*	Basement - B06 - Cold Water Run	White/Yellow Fibrous Heterogeneous	8% Cellulose 52% Min. Wool	40% Non-fibrous (Other)	None Detected
LA-115 *042420683-0115*	Basement - B06 - Cold Water Elbow	Gray/White/Yellow Fibrous Heterogeneous	2% Cellulose 23% Min. Wool	40% Ca Carbonate 35% Non-fibrous (Other)	None Detected
LA-116-Wrap *042420683-0116*	Basement - B06 - Cold Water Elbow	Gray/White Fibrous Heterogeneous	35% Cellulose	15% Ca Carbonate 50% Non-fibrous (Other)	None Detected
LA-116-Mud *042420683-0116A*	Basement - B06 - Cold Water Elbow	Gray/White Fibrous Heterogeneous	30% Min. Wool	35% Ca Carbonate 35% Non-fibrous (Other)	None Detected
LA-117-Wrap *042420683-0117*	Basement - B06 - Cold Water Elbow	Gray/White Fibrous Heterogeneous	35% Cellulose	10% Ca Carbonate 55% Non-fibrous (Other)	None Detected
LA-117-Mud *042420683-0117A*	Basement - B06 - Cold Water Elbow	Gray/White Fibrous Heterogeneous	30% Min. Wool	35% Ca Carbonate 35% Non-fibrous (Other)	None Detected
LA-118 *042420683-0118*	Basement - B06 - Circulating Water Run	Gray/White/Yellow Fibrous Heterogeneous	45% Cellulose 28% Glass	18% Ca Carbonate 9% Non-fibrous (Other)	None Detected
LA-119 *042420683-0119*	Basement - B06 - Circulating Water Run	Yellow Fibrous Homogeneous	95% Glass	5% Non-fibrous (Other)	None Detected
LA-120 *042420683-0120*	Basement - B06 - Circulating Water Run	Yellow Fibrous Homogeneous	96% Glass	4% Non-fibrous (Other)	None Detected
LA-121 *042420683-0121*	Basement - B06 - Circulating Water Elbow	Gray/White Fibrous Homogeneous		20% Ca Carbonate 42% Non-fibrous (Other)	**38% Chrysotile**
LA-122 *042420683-0122*	Basement - B06 - Circulating Water Elbow	Gray/White Fibrous Homogeneous		20% Ca Carbonate 47% Non-fibrous (Other)	**33% Chrysotile**
LA-123 *042420683-0123*	Basement - B06 - Circulating Water Elbow	Gray/White Fibrous Homogeneous		18% Ca Carbonate 42% Non-fibrous (Other)	**40% Chrysotile**
LA-124 *042420683-0124*	Basement - B20 - Steam Run	Yellow Fibrous Homogeneous	96% Glass	4% Non-fibrous (Other)	None Detected
LA-125 *042420683-0125*	Basement - B23 - Steam Run	Yellow Fibrous Homogeneous	96% Glass	4% Non-fibrous (Other)	None Detected
LA-126 *042420683-0126*	Basement - B33 - Steam Run	Yellow Fibrous Homogeneous	94% Glass	6% Non-fibrous (Other)	None Detected
LA-127 *042420683-0127*	Basement - B20 - Steam Elbow	Gray Fibrous Homogeneous	3% Cellulose 20% Min. Wool	44% Ca Carbonate 33% Non-fibrous (Other)	None Detected
LA-128 *042420683-0128*	Basement - B23 - Steam Elbow	Gray Fibrous Homogeneous	4% Cellulose 18% Min. Wool	46% Ca Carbonate 32% Non-fibrous (Other)	None Detected
LA-129 *042420683-0129*	Basement - B33 - Steam Elbow	Gray/White Fibrous Heterogeneous	15% Cellulose 19% Min. Wool	45% Ca Carbonate 21% Non-fibrous (Other)	None Detected
LA-130 *042420683-0130*	Basement - B20 - Hot Water Run	Yellow Fibrous Homogeneous	95% Glass	5% Non-fibrous (Other)	None Detected

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EMSL Order:	042420683
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Test Report: Asbestos Analysis of Bulk Materials via AHERA Method 40CFR 763 Subpart E Appendix E supplemented with EPA 600/R-93/116 using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
LA-131 *042420683-0131*	Basement - B20 - Hot Water Run	Yellow Fibrous Homogeneous	96% Glass	4% Non-fibrous (Other)	None Detected
LA-132 *042420683-0132*	Basement - B20 - Hot Water Run	Yellow Fibrous Homogeneous	96% Glass	4% Non-fibrous (Other)	None Detected
LA-133 *042420683-0133*	Basement - B20 - Hot Water Elbow	Gray/Beige Fibrous Heterogeneous	30% Cellulose 15% Min. Wool	45% Ca Carbonate 10% Non-fibrous (Other)	None Detected
LA-134 *042420683-0134*	Basement - B20 - Hot Water Elbow	Gray Fibrous Homogeneous	6% Cellulose 19% Min. Wool	43% Ca Carbonate 32% Non-fibrous (Other)	None Detected
LA-135 *042420683-0135*	Basement - B20 - Hot Water Elbow	Gray/Yellow Fibrous Heterogeneous	18% Cellulose 12% Min. Wool 38% Glass	20% Ca Carbonate 12% Non-fibrous (Other)	None Detected
LA-136 *042420683-0136*	Basement - B20 - Cold Water Run	Yellow Fibrous Homogeneous	98% Glass	2% Non-fibrous (Other)	None Detected
LA-137 *042420683-0137*	Basement - B20 - Cold Water Run	Yellow Fibrous Homogeneous	94% Glass	6% Non-fibrous (Other)	None Detected
LA-138 *042420683-0138*	Basement - B20 - Cold Water Run	Yellow Fibrous Homogeneous	95% Glass	5% Non-fibrous (Other)	None Detected
LA-139 *042420683-0139*	Basement - B20 - Cold Water Elbow	Gray Fibrous Homogeneous	3% Cellulose 19% Min. Wool	40% Ca Carbonate 38% Non-fibrous (Other)	None Detected
LA-140 *042420683-0140*	Basement - B20 - Cold Water Elbow	Gray Fibrous Homogeneous	4% Cellulose 20% Min. Wool	42% Ca Carbonate 34% Non-fibrous (Other)	None Detected
LA-141 *042420683-0141*	Basement - B20 - Cold Water Elbow	Gray/White Fibrous Heterogeneous	26% Cellulose 16% Min. Wool	35% Ca Carbonate 23% Non-fibrous (Other)	None Detected
LA-142 *042420683-0142*	Basement - B20 - Circulating Run	Yellow Fibrous Homogeneous	97% Glass	3% Non-fibrous (Other)	None Detected
LA-143 *042420683-0143*	Basement - B20 - Circulating Run	Yellow Non-Fibrous Homogeneous	95% Glass	5% Non-fibrous (Other)	None Detected
LA-144 *042420683-0144*	Basement - B20 - Circulating Run	Yellow Fibrous Homogeneous	96% Glass	4% Non-fibrous (Other)	None Detected
LA-145 *042420683-0145*	Basement - B20 - Circulating Elbow	Gray/White Non-Fibrous Homogeneous		22% Ca Carbonate 40% Non-fibrous (Other)	**38% Chrysotile**
LA-146 *042420683-0146*	Basement - B20 - Circulating Elbow	Gray/White Fibrous Homogeneous		23% Ca Carbonate 37% Non-fibrous (Other)	**40% Chrysotile**
LA-147 *042420683-0147*	Basement - B20 - Circulating Elbow	Gray/White Fibrous Heterogeneous	15% Cellulose	24% Ca Carbonate 25% Non-fibrous (Other)	**36% Chrysotile**

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EMSL Order:	042420683
Customer ID:	ATC55
Customer PO:	
Project ID:	

Analyst(s)

Jimmy Encalada (33)
Steve Jusczuk (42)
Anthony Miraglia (30)
April Schmuck (24)
Tomas Montes De Oca (33)

Samantha Rundstrom, Laboratory Manager
or Other Approved Signatory

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Samples analyzed by EMSL Analytical, Inc. Carle Place, NY NVLAP Lab Code 101048-10, CA ELAP 2339

Initial report from: 10/09/2024 01:49:39

OrderID: 042420683

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Asbestos Chain of Custody (Air, Bulk, Soil)

EMSL Order Number / Lab Use Only: CINN20683

EMSL Analytical, Inc.
Cinnaminson, NJ 08077
PHONE: 1-800-220-3675
EMAIL: c@emsl.com

If Bill-To is the same as Report-To leave this section blank. Third-party billing requires written authorization

Customer Information		Billing Information	
Customer ID:		Billing ID:	
Company Name:	Atlas Technical	Company Name:	Atlas Technical
Contact Name:		Billing Contact:	Steve Hudson
Street Address:	11117 Mockingbird Drive	Street Address:	11117 Mockingbird Drive
City, State, Zip:	Omaha NE 6813	City, State, Zip:	Omaha NE 68137
Country:	US	Country:	US
Phone:	402-697-9747	Phone:	402-697-9747
Email(s) for Report:	eric.l.brown@oneatlas.com	Email(s) for Invoice:	

Project Information

Project Name/No.: WOODWARD TUNNEL SURVEY 20405074 75
Purchase Order:
EMSL LIMS Project ID (If applicable, EMSL will provide):
US State where samples collected: IA
State of Connecticut (CT) must select project location: ☐ Commercial (Taxable) ☐ Residential (Non-Taxable)
Sampled By Name: Eric Brown
Sampled By Signature: ERIC BROWN
No. of Samples in Shipment: 147

Turn-Around-Time (TAT)

☐ 3 Hour ☐ 4-4.5 Hour ☐ 6 Hour ☐ 24 Hour ☐ 32 Hour ☒ 48 Hour ☐ 72 Hour ☐ 96 Hour ☐ 1 Week ☐ 2 Week

TEM Air 3-6 Hour, please call ahead to schedule. 32 Hour TAT available for select tests only; samples must be submitted by 11:30 am.

Test Selection

PCM Air
- ☐ NIOSH 7400
- ☐ NIOSH 7400 w/ 8hr. TWA

PLM - Bulk (reporting limit)
- ☑ PLM EPA 600/R-93/116 (<1%)
- ☐ PLM EPA NOB (<1%)
- ☐ POINT COUNT
  - ☐ 400 (<0.25%) ☐ 1,000 (<0.1%)
- POINT COUNT w/ GRAVIMETRIC
  - ☐ 400 (<0.25%) ☐ 1,000 (<0.1%)
- ☐ NIOSH 9002 (<1%)
- ☐ NYS 198.1 (Friable - NY)
- ☐ NYS 198.6 NOB (Non-Friable - NY)
- ☐ NYS 198.8 (Vermiculite SM-V)

TEM - Air
- ☐ AHERA 40 CFR, Part 763
- ☐ NIOSH 7402
- ☐ EPA Level II
- ☐ ISO 10312*

TEM - Bulk
- ☐ TEM EPA NOB
- ☐ NYS NOB 198.4 (Non-Friable-NY)
- ☐ TEM EPA 600/R-93/116 w Milling Prep (0.1%)

Other Test (please specify)

TEM - Settled Dust
- ☐ Microvac - ASTM D5755
- ☐ Wipe - ASTM D6480
- ☐ Qualitative via Filtration Prep
- ☐ Qualitative via Drop Mount Prep

Soil - Rock - Vermiculite (reporting limit)*
- ☐ PLM EPA 600/R-93/116 with milling prep (<0.25%)
- ☐ PLM EPA 600/R-93/116 with milling prep (<0.1%)
- ☐ TEM EPA 600/R-93/116 with milling prep (<0.1%)
- ☐ TEM Qualitative via Filtration Prep
- ☐ TEM Qualitative via Drop Mount Prep

*Please call with your project-specific requirements

☐ Positive Stop - Clearly Identified Homogeneous Areas (HA) | Filter Pore Size (Air Samples) ☐ 0.8um ☐ 0.45um

Sample Number	Sample Location / Description	Volume, Area or Homogeneous Area	Date / Time Sampled (Air Monitoring Only)
	See the other sheets		

RECEIVED EMSL CINNAMINSON, NJ 2024 OCT -4 A 11:14

RECEIVED EMSL ANALYTICAL, INC. Carle Place, NY OCT 07 2024 PM07:18

Special Instructions and/or Regulatory Requirements (Sample Specifications, Processing Methods, Limits of Detection, etc.):

Method of Shipment:			Sample Condition Upon Receipt:		
Relinquished by: Eric Brown		Date/Time: 10/3/24 17:00	Received by: EFT		Date/Time 10/4/24
Relinquished by:		Date/Time:	Received by:		Date/Time

Controlled Document - COC-05 Asbestos R15 4/23/2021

☐ AGREE TO ELECTRONIC SIGNATURE (By checking, I consent to signing this Chain of Custody document by electronic signature.)

EMSL Analytical, Inc.'s Laboratory Terms and Conditions are incorporated into this Chain of Custody by reference in their entirety. Submission of samples to EMSL Analytical, Inc. constitutes acceptance and acknowledgment of all terms and conditions by Customer.

Jesus Montalvo 10/8/24

10/8/24

10/8/24

147

OrderID: 042420683

CMY20683

ASBESTOS BULK SAMPLE FORM

Page 1 of 12

ATLAS

11117 Mockingbird Drive
Omaha, NE 68137

Phone (402) 697-9747
Fax (402) 597-8532

Project Information

Client:	Project Description: LINDEN A&B	Project Manager: JH Inspector: EB
Date: 9/27/24	Site Location: WOODWARD	ATLAS PROJECT NUMBER: 204B507475

Sample #	Material Description	Floor	Sample Location	Quantity
LA-1	CERAMIC FLOOR TILE GROUT DK GRAY	B	B01	
LA-2	2'x4' CEILING TILE	B	B01	
LA-3	CMU GROUT	B	B01	
LA-4	DRYWALL	B	B01B	
LA-5	DRYWALL MUD	B	B01B	
LA-6	DUCT SEALANT GRAY	B	~~B01B~~ B05	
LA-7	4" BLACK COVE BASE	B	B10	
LA-8	COVE BASE MASTIC	B	B10	
LA-9	SINK INSULATION	B	B08	
LA-10	TEXTURED PAINT	B	B09	
LA-11	" "	B	B09	
LA-12	" "	B	B09	
LA-13	VIBRATION DAMPER	B	B04	2

RECEIVED
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2024 OCT -4 A 11:

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Carle Place, NY
OCT 07 2024 PM07:19

Jorge Montalvo 10/8/24

10/8/24

10/8/24

14 BD

10/8/24

OrderID: 042420683

042420683

ASBESTOS BULK SAMPLE FORM

ATLAS
11117 Mockingbird Drive
Omaha, NE 68137
Phone (402) 697-9747
Fax (402) 597-8532

Project Information

Client:	Project Description: LINDEN A & B	Project Manager: SA Inspector: EB
Date: 9/27/24	Site Location: WOODWARD	ATLAS PROJECT NUMBER: 24BS07475

Sample #	Material Description	Floor	Sample Location	Quantity
LA-14	DRYWALL TAPE	B	B06	
LA-15	DRYWALL MUD	B	B06	
LA-16	VIBRATION DAMPER	B	B12	
LA-17	4" COVE BASE GRAY	B	B06	
LA-18	COVE BASE MASTIC	B	B06	
LA-19	TERRAZZO	B	B06 STAIRS	
LA-20	DRYWALL MUD	B	B06	
LA-21	VIBRATION DAMPER	B	B16	
LA-22	CERAMIC FLOOR TILE GROUT	B	B17	
LA-23	RED SHEET FLOORING	B	B32	
LA-24	SHEET FLOORING MASTIC BLACK	B	B32	
LA-25	12"x12" VFT	B	B20	
LA-26	VFT MASTIC TAN	B	B20	

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2024 OCT -4 A 11:14

Jonas Montoledo 10/8/24

10/8/24

10/8/24

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042420683

ASBESTOS BULK SAMPLE FORM

ATLAS
11117 Mockingbird Drive
Omaha, NE 68137
Phone (402) 697-9747
Fax (402) 597-8532

Project Information

Client:	Project Description: LINDEN A & B	Project Manager: SH Inspector: EB
Date: 9/27/24	Site Location: WOODWARD	ATLAS PROJECT NUMBER: 24B507475

Sample #	Material Description	Floor	Sample Location	Quantity
LA-27	12"X12" VFT (DARKER)	B	B20	
LA-28	12"X12" VFT	B	B33	
LA-29	VFT MASTIC	B	B33	
LA-30	SHEET FLOORING GREEN	B	B28	
LA-31	SHEET FLOORING TAN MASTIC	B	B28	
LA-32	GREEN CERAMIC TILE GROUT GRAY	B	RESTROOM B25	
LA-33	CARPET MASTIC TAN	B	B28	
LA-34	1"X1" CERAMIC TILE GROUT	B	B26	
LA-35	2'X2' CEILING TILE	B	B20	
LA-36	CMU MORTAR	B	B25	
LA-37	DRYWALL	B	B20	
LA-38	DRYWALL MUD	B	B20	
LA-39	CARPET MASTIC	B	B20	

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042420683

ASBESTOS BULK SAMPLE FORM

ATLAS
11117 Mockingbird Drive
Omaha, NE 68137
Phone (402) 697-9747
Fax (402) 597-8532

Project Information

Client:	Project Description: LINDEN A & B	Project Manager: SH Inspector: EB
Date: 9/27/24	Site Location: WOODWARD	ATLAS PROJECT NUMBER: 2048507475

Sample #	Material Description	Floor	Sample Location	Quantity
LA40	DRYWALL TAPE	B	B20	
LA-41	2'x4' CEILING TILE	1	131	
LA-42	SHEET FLOORING WHITE	1	118	
LA-43	SHEET FLOORING MASTIC	1	118	
LA-44	SHEET FLOORING	1	112	
LA-45	SHEET FLOORING MASTIC	1	112	
LA-46	CAULK WHITE	1	131	
LA-47	CAULK BROWN	1	141	
LA-49	CAULK WHITE	1	~~B44~~ 138	
LA49	DRYWALL MUD	1	140	
LA50	CERAMIC TILE GROUT	1	140	
LA51	PLASTER	1	131	
LA52	DRYWALL MUD	1	137	

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ASBESTOS BULK SAMPLE FORM

ATLAS
11117 Mockingbird Drive
Omaha, NE 68137
Phone (402) 697-9747
Fax (402) 597-8532

Project Information

Client:	Project Description: LINDEN A & B	Project Manager: SH Inspector: EB
Date: 9/27/24	Site Location: WOODWARD	ATLAS PROJECT NUMBER: 204B507475

Sample #	Material Description	Floor	Sample Location	Quantity
LA53	VIBRATION DAMPER	1	110	2
LA54	PLASTER	1	110	
LA55	CEILING TILE	1	110	
LA56	DRYWALL MUD	1	118	
LA57	Gray Floor Coating	1	119	
LA58	PLASTER	1	120	
LA59	terruzzo Floor	1	120	
LA60	Gray Caulk	1	120	
LA61	LT. Gray window Glazing	2	220	
LA62	Vibation damper	2	201	2
LA63	Sheet Floor	2	214	
LA64	Sheet Floor mastic	2	214	
LA65	dark sheet Floor	2	216	

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ASBESTOS BULK SAMPLE FORM

ATLAS
11117 Mockingbird Drive
Omaha, NE 68137
Phone (402) 697-9747
Fax (402) 597-8532

Project Information

Client:	Project Description: Linden A & B	Project Manager: SH Inspector: EB
Date: 9/30/24	Site Location: Wood Ward	ATLAS PROJECT NUMBER: 2048507475

Sample #	Material Description	Floor	Sample Location	Quantity
LA66	dark Sheet Floor mastic	2	216	
LA67	Sink insulation-black	2	216	1 on A 1 on B
LA68	Red Floor tile grout	2	216	
LA69	Cream Sheet Floor	2	210	
LA70	Cream sheet Floor mastic	2	210	
LA71	Clear Caulk	2	206	
LA72	White Caulk	2	205	
LA73	Yellow Brick mortar	2	207 - Pipe chase	
LA74	Pink Floor tile	2	207	
LA75	Plaster	2	207	
LA76	088- White Caulk	2	208	
LA77	6in Black Cove Base	2	208	
LA78	6in Cove Base mastic	2	208	

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ATLAS
11117 Mockingbird Drive
Omaha, NE 68137
Phone (402) 697-9747
Fax (402) 597-8532

Project Information

Client:	Project Description: Linden A+B	Project Manager: SH Inspector: EB
Date: 9/30/24	Site Location: Woodward	ATLAS PROJECT NUMBER: 204BS07475

Sample #	Material Description	Floor	Sample Location	Quantity
LA79	Drywall mud	2	208	
LA80	White Caulk	2	208	
LA81	Drywall mud	2	214	
LA82	Window Glazing	2	214	
LA83	Wall plaster	2	214	
LA84	Drywall	2	213	
LA85	Satin wood Floor Coating	2	214	
LA-86	Ceiling tile	2	214	
LA87	Yellow Brick mortar	2	237 - Pipe Chase	
LA88	Pink tile Grout	2	237	
LA89	Plaster	2	237	
LA90	terrazzo floor	2	228	
LA91	White Caulk	2	236	

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ASBESTOS BULK SAMPLE FORM

ATLAS
11117 Mockingbird Drive
Omaha, NE 68137
Phone (402) 697-9747
Fax (402) 597-8532

Project Information

Client:	Project Description: Linden A + B	Project Manager: Inspector: EB
Date: 9/30/24	Site Location: Woodard	ATLAS PROJECT NUMBER: 204B507475

Sample #	Material Description	Floor	Sample Location	Quantity
LA92	Green 9x9 tile Grout	2	236	
LA93	TSI - elbow light gray	2	235 - pipe chase	
LA94	TSI - Straight pipe elbow large diameter	2	235 - Pipe Chase	
LA95	Red tile Grout	2	229	
LA96	Vibration damper	2	230	2
LA97	Plaster	2	230	
LA98	Ceiling tile	2	229	
LA99	Dry wall mud	2	238	
LA100	Steam Run	B	B06	
LA101	Steam Run	B	B10	
LA102	Steam Run	B	B02	
LA103	Steam elbow	B	B06	
LA104	Steam elbow	B	B10	

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Jamie Montoya Ortiz 10/8/24

10/8/24

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ASBESTOS BULK SAMPLE FORM

ATLAS
11117 Mockingbird Drive
Omaha, NE 68137
Phone (402) 697-9747
Fax (402) 597-8532

Project Information

Client:	Project Description: LINDEN A & B	Project Manager: SH Inspector: EB
Date: 9/30/24	Site Location: WOODWARD	ATLAS PROJECT NUMBER: 204BS07475

Sample #	Material Description	Floor	Sample Location	Quantity
LA 105	Steam elbow	B	B02	
LA 106	Hot water run	B	B06	
LA 107	Hot water run	B	B06	
LA 108	Hot water run	B	B06	
LA 109	Hot water elbow	B	B06	
LA 110	HW elbow	B	B06	
LA 111	HW elbow	B	B06	
LA 112	HW Run	B	B06	
LA 113	CW Run	B	B06	
LA 114	CW Run	B	B06	
LA 115	CW elbow	B	B06	
LA 116	CW elbow	B	B06	
LA 117	CW elbow	B	B06	

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HW = Hot water
CW = Cold Water
Cir = Circulation water

10/8/24

Jorge Montalvo Ocs 10/8/24

10/8/24

(14) BD

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ASBESTOS BULK SAMPLE FORM

ATLAS
11117 Mockingbird Drive
Omaha, NE 68137
Phone (402) 697-9747
Fax (402) 597-8532

Project Information

Client:	Project Description: LINDEN A&D	Project Manager: SH Inspector: EB
Date: 9/30/24	Site Location: WOODWARD	ATLAS PROJECT NUMBER: 209BS07475

Sample #	Material Description	Floor	Sample Location	Quantity
LA 118	Cir run	B	B06	
LA 119	Cir Run	B	B06	
LA 120	Cir Run	B	B06	
LA 121	Cir elbow	B	B06	
LA 122	Cir elbow	B	B06	
LA 123	Cir elbow	B	B06	
LA 124	Steam Run	B	B20	
LA 125	Steam Run	B	B23	
LA 126	Steam Run	B	B33	
LA 127	Steam elbow	B	B20	
LA 128	Steam elbow	B	B23	
LA 129	Steam elbow	B	B33	
LA 130	Hot water rum	B	B20	

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Cir= circulating Water

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11117 Mockingbird Drive
Omaha, NE 68137
Phone (402) 697-9747
Fax (402) 597-8532

Project Information

Client:	Project Description: LINDEN A & B	Project Manager: SH Inspector: EB
Date: 9/30/24	Site Location: WOODWARD	ATLAS PROJECT NUMBER: 204B507475

Sample #	Material Description	Floor	Sample Location	Quantity
LA 131	HW Run	B	B20	
LA 132	HW Run	B	B20	
LA 133	HW Elbow	B	B20	
LA 134	HW Elbow	B	B20	
LA 135	HW Elbow	B	B20	
LA 136	CW Run	B	B20	
LA 137	CW Run	B	B20	
LA 138	CW Run	B	B20	
LA 139	CW Elbow	B	B20	
LA 140	CW Elbow	B	B20	
LA 141	CW Elbow	B	B20	
LA 142	Cir Run	B	B20	
LA 143	Cir Run	B	B20	

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HW = Hot water
CW = Cold water
Cir = Circulating water

10/8/24

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Jesus Montalvo 10/8/24

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OrderID: 042420683

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ASBESTOS BULK SAMPLE FORM

ATLAS
11117 Mockingbird Drive
Omaha, NE 68137
Phone (402) 697-9747
Fax (402) 597-8532

Project Information

Client:	Project Description: LINDEN A & B	Project Manager: SH Inspector: EB
Date: 9/30/24	Site Location: WOODWARD	ATLAS PROJECT NUMBER:

Sample #	Material Description	Floor	Sample Location	Quantity
LA 144	Cir Run	B	B20	
LA 145	Cir Elbow	B	B20	
LA 146	Cir Elbow	B	B20	
LA 147	Cir Elbow	B	B20	

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Cir = Circulating Water

Jonas Montalbo 10/8/24

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14 B20

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EMSL Analytical, Inc.

200 Route 130 North Cinnaminson, NJ 08077
Tel/Fax: (800) 220-3675 / (856) 786-5974
http://www.EMSL.com / cinnasblab@EMSL.com

EMSL Order:	042524369
Customer ID:	ATC55
Customer PO:	
Project ID:	

Attention:	Phil Thomas	**Phone:**	(402) 697-9747
	Atlas Technical	**Fax:**	(402) 597-8532
	11117 Mockingbird Drive	**Received Date:**	12/15/2025 8:55 AM
	Omaha, Nebraska 68137	**Analysis Date:**	12/15/2025
		Collected Date:	
Project:	Linden A-D Decentralization / 204BS09286		

Test Report: Asbestos Analysis of Bulk Materials via AHERA Method 40CFR 763 Subpart E Appendix E supplemented with EPA 600/R-93/116 using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
LA-149-Plaster *042524369-0001*	Linden A - 2nd Fl Kitchen - Plaster	Gray Fibrous Homogeneous		94% Non-fibrous (Other)	**6% Chrysotile**
LA-149-Plaster 2 *042524369-0001A*	Linden A - 2nd Fl Kitchen - Plaster	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	**<1% Chrysotile**
LA-150-Plaster *042524369-0002*	Linden A - Room 218 - Plaster	Gray Fibrous Homogeneous		93% Non-fibrous (Other)	**7% Chrysotile**
LA-150-Plaster 2 *042524369-0002A*	Linden A - Room 218 - Plaster	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	**<1% Chrysotile**
LA-151-Plaster *042524369-0003*	Linden A - 2nd Fl Central Corridor - Plaster	Gray Fibrous Homogeneous		92% Non-fibrous (Other)	**8% Chrysotile**
LA-151-Plaster 2 *042524369-0003A*	Linden A - 2nd Fl Central Corridor - Plaster	Gray/White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	**<1% Chrysotile**
LA-152-Plaster *042524369-0004*	Linden - South Corridor - Plaster	Gray Fibrous Homogeneous		92% Non-fibrous (Other)	**8% Chrysotile**
LA-152-Plaster 2 *042524369-0004A*	Linden - South Corridor - Plaster	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	**<1% Chrysotile**

Analyst(s)

Michael Bocchicchio (6)
Russell Hayden (2)

Samantha Sweeney

Samantha Sweeney, Laboratory Manager
or Other Approved Signatory

EMSL maintains liability limited to cost of analysis. Interpretation and use of test results are the responsibility of the client. This report relates only to the samples reported above, and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. The report reflects the samples as received. Results are generated from the field sampling data (sampling volumes and areas, locations, etc.) provided by the client on the Chain of Custody. Samples are within quality control criteria and met method specifications unless otherwise noted. The above analyses were performed in general compliance with Appendix E to Subpart E of 40 CFR (previously EPA 600/M4-82-020 “Interim Method”) but augmented with procedures outlined in the 1993 (”final”) version of the method. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the federal government. Non-friable organically bound materials present a problem matrix and therefore EMSL recommends gravimetric reduction prior to analysis. Unless requested by the client, building materials manufactured with multiple layers (i.e. linoleum, wallboard, etc.) are reported as a single sample. Estimation of uncertainty is available on request.

Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ NVLAP Lab Code 101048-0, AIHA LAP, LLC-IHLAP Lab 100194, PA ID# 68-00367, LA #04127

Initial report from: 12/16/2025 08:47:52

OrderID: 042524369

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Asbestos Chain of Custody (Air, Bulk, Soil)

EMSL Order Number / Lab Use Only: 042524369

EMSL Analytical, Inc.
Cinnaminson, NJ 08077
PHONE: 1-800-220-3675
EMAIL: cs@emsl.com

If Bill-To is the same as Report-To leave this section blank. Third-party billing requires written authorization.

Customer Information		Billing Information	
Customer ID:		Billing ID:	
Company Name:	Atlas Technical Omaha, NE 68137 US	Company Name:	Atlas Technical Omaha, NE 68137 US
Contact Name:	Phil Thomas	Billing Contact:	Phil Thomas
Street Address:	11117 Mockingbird Drive	Street Address:	11117 Mockingbird Drive
City, State, Zip:	Omaha NE 6813	Country: US	Omaha NE 68137 Country: US
Phone:	(402) 697-9747	Phone:	(402) 697-9747
Email(s) for Report:	phil.thomas@oneatlas.com	Email(s) for Invoice:	

Project Information

Project Name/No.: Linden A-D Decentralization 204BS09286 | Purchase Order:

EMSL LIMS Project ID: (If applicable, EMSL will provide) | US State where samples collected: IA | State of Connecticut (CT) must select project location: ☐ Commercial (Taxable) ☐ Residential (Non-Taxable)

Sampled By Name: Chris Nicolet | Sampled By Signature: Chris Nicolet | No. of Samples in Shipment: 4

Turn-Around-Time (TAT)

☐ 3 Hour ☐ 4-4.5 Hour ☐ 6 Hour ☑ 24 Hour ☐ 32 Hour ☐ 48 Hour ☐ 72 Hour ☐ 96 Hour ☐ 1 Week ☐ 2 Week

TEM Air 3-6 Hour, please call ahead to schedule. 32 Hour TAT available for select tests only; samples must be submitted by 11:30 am.

Test Selection

PCM Air
- ☐ NIOSH 7400
- ☐ NIOSH 7400 w/ 8hr. TWA

PLM - Bulk (reporting limit)
- ☑ PLM EPA 600/R-93/116 (<1%)
- ☐ PLM EPA NOB (<1%)
- ☐ POINT COUNT
  - ☐ 400 (<0.25%) ☐ 1,000 (<0.1%)
- POINT COUNT w/ GRAVIMETRIC
  - ☐ 400 (<0.25%) ☐ 1,000 (<0.1%)
- ☐ NIOSH 9002 (<1%)
- ☐ NYS 198.1 (Friable - NY)
- ☐ NYS 198.6 NOB (Non-Friable - NY)
- ☐ NYS 198.8 (Vermiculite SM-V)

TEM - Air
- ☐ AHERA 40 CFR, Part 763
- ☐ NIOSH 7402
- ☐ EPA Level II
- ☐ ISO 10312*

TEM - Bulk
- ☐ TEM EPA NOB
- ☐ NYS NOB 198.4 (Non-Friable-NY)
- ☐ TEM EPA 600/R-93/116 w Milling Prep (0.1%)

Other Test (please specify)

TEM - Settled Dust
- ☐ Microvac - ASTM D5755
- ☐ Wipe - ASTM D6480
- ☐ Qualitative via Filtration Prep
- ☐ Qualitative via Drop Mount Prep

Soil - Rock - Vermiculite (reporting limit)*
- ☐ PLM EPA 600/R-93/116 with milling prep (<0.25%)
- ☐ PLM EPA 600/R-93/116 with milling prep (<0.1%)
- ☐ TEM EPA 600/R-93/116 with milling prep (<0.1%)
- ☐ TEM Qualitative via Filtration Prep
- ☐ TEM Qualitative via Drop Mount Prep

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*Please call with your project-specific requirements.

☐ Positive Stop - Clearly Identified Homogeneous Areas (HA) | Filter Pore Size (Air Samples) ☐ 0.8um ☐ 0.45um

Sample Number	Sample Location / Description	Volume, Area or Homogeneous Area	Date / Time Sampled (Air Monitoring Only)
LA-149	Plaster/Linden A - 2nd Fl Kitchen		
LA-150	Plaster/Linden A - Room 218		
LA-151	Plaster/Linden A - 2nd Fl Central Corridor		
LA-152	Plaster/Linden South Corridor		

Special Instructions and/or Regulatory Requirements (Sample Specifications, Processing Methods, Limits of Detection, etc.)

(4)

Method of Shipment: Fedex		Sample Condition Upon Receipt:	
Relinquished by:	Date/Time: 12/12/25 1311	Received by: EFX	Date/Time: 12/15/25 0855
Relinquished by:	Date/Time:	Received by:	Date/Time

Controlled Document - COC-05 Asbestos R15 4/23/2021

☐ AGREE TO ELECTRONIC SIGNATURE (By checking, I consent to signing this Chain of Custody document by electronic signature.)

EMSL Analytical, Inc.'s Laboratory Terms and Conditions are incorporated into this Chain of Custody by reference in their entirety. Submission of samples to EMSL Analytical, Inc. constitutes acceptance and acknowledgment of all terms and conditions by Customer.

APPENDIX B

LEAD PAINT ANALYTICAL RESULTS AND CHAIN OF CUSTODY

EMSL Analytical, Inc.

200 Route 130, Cinnaminson, NJ, 08077
Telephone: 856-858-4800 Fax:856-786-5974
EMSL-CIN-01

EMSL Order ID: 012432527
LIMS Reference ID: AC32527
EMSL Customer ID: ATC55

Attention: Steve Hudson
Atlas Technical [ATC55]
11117 Mockingbird Drive
Omaha, NE 68137
(402) 697-9747
steve.hudson@oneatlas.com

Project Name: Woodward Tunnel Survey 204BS07475
Customer PO:
EMSL Sales Rep: Anthony DeRosa
Received: 10/04/2024 10:00
Reported: 10/08/2024 15:01

Analytical Results

Analyte	Results	RL	Weight(g)	Prep Date & Tech	Prep Method	Analysis Date & Analyst	Analytical Method	Q	DF
Client Sample ID: PCLA-1/Basement B01 - Concrete - White									**Date Sampled: 09/27/24**
Matrix: Chips									**LIMS Reference ID: AC32527-01**
Lead	0.032 % wt	0.008 % wt	0.2893	10/07/24 KD1	SW-846 3050B	10/08/24 PMX	SW846-7000B		1
Sample Comments:									
Client Sample ID: PCLA-2/Basement B01 - Concrete - V. Lt. Blue									**Date Sampled: 09/27/24**
Matrix: Chips									**LIMS Reference ID: AC32527-02**
Lead	0.011 % wt	0.008 % wt	0.2616	10/07/24 KD1	SW-846 3050B	10/08/24 PMX	SW846-7000B		1
Sample Comments:									
Client Sample ID: PCLA-3/Basement B01 - Concrete - Lt. Green									**Date Sampled: 09/27/24**
Matrix: Chips									**LIMS Reference ID: AC32527-03**
Lead	0.065 % wt	0.008 % wt	0.2909	10/07/24 KD1	SW-846 3050B	10/08/24 PMX	SW846-7000B		1
Sample Comments:									
Client Sample ID: PCLA-4/Basement B10 - Concrete - Lt. Peach									**Date Sampled: 09/27/24**
Matrix: Chips									**LIMS Reference ID: AC32527-04**
Lead	<0.008 % wt	0.008 % wt	0.2836	10/07/24 KD1	SW-846 3050B	10/08/24 PMX	SW846-7000B		1
Sample Comments:									
Client Sample ID: PCLA-5/1st Floor B126 - Brick - Green									**Date Sampled: 09/27/24**
Matrix: Chips									**LIMS Reference ID: AC32527-05**
Lead	<0.033 % wt	0.033 % wt	0.06	10/07/24 KD1	SW-846 3050B	10/08/24 PMX	SW846-7000B		1
Sample Comments:									
Client Sample ID: PCLA-6/1st Floor B138 - Brick - Lt. Blue									**Date Sampled: 09/27/24**
Matrix: Chips									**LIMS Reference ID: AC32527-06**
Lead	<0.011 % wt	0.011 % wt	0.1813	10/07/24 KD1	SW-846 3050B	10/08/24 PMX	SW846-7000B		1
Sample Comments:									
Client Sample ID: PCLA-7/2nd Floor 220 - Metal - Black									**Date Sampled: 09/27/24**
Matrix: Chips									**LIMS Reference ID: AC32527-07**
Lead	0.18 % wt	0.008 % wt	0.2955	10/07/24 KD1	SW-846 3050B	10/08/24 PMX	SW846-7000B		1
Sample Comments:									
Client Sample ID: PCLA-8/2nd Floor 216 - Metal - Gray									**Date Sampled: 09/27/24**
Matrix: Chips									**LIMS Reference ID: AC32527-08**
Lead	<0.008 % wt	0.008 % wt	0.2815	10/07/24 KD1	SW-846 3050B	10/08/24 PMX	SW846-7000B		1
Sample Comments:									
Client Sample ID: PCLA-9/2nd Floor 216 - Metal - White									**Date Sampled: 09/27/24**
Matrix: Chips									**LIMS Reference ID: AC32527-09**
Lead	<0.008 % wt	0.008 % wt	0.2955	10/07/24 KD1	SW-846 3050B	10/08/24 PMX	SW846-7000B		1
Sample Comments:									

EMSL Analytical, Inc.

200 Route 130, Cinnaminson, NJ, 08077
Telephone: 856-858-4800 Fax:856-786-5974
EMSL-CIN-01

EMSL Order ID: 012432527
LIMS Reference ID: AC32527
EMSL Customer ID: ATC55

Attention: Steve Hudson
Atlas Technical [ATC55]
11117 Mockingbird Drive
Omaha, NE 68137
(402) 697-9747
steve.hudson@oneatlas.com

Project Name: Woodward Tunnel Survey 204BS07475
Customer PO:
EMSL Sales Rep: Anthony DeRosa
Received: 10/04/2024 10:00
Reported: 10/08/2024 15:01

Analytical Results (Continued)

Analyte	Results	RL	Weight(g)	Prep Date & Tech	Prep Method	Analysis Date & Analyst	Analytical Method	Q	DF
Client Sample ID: PCLA-10/2nd Floor 210 - Plaster - White									**Date Sampled: 09/27/24**
Matrix: Chips									**LIMS Reference ID: AC32527-10**
Lead	0.076 % wt	0.008 % wt	0.25	10/07/24 KD1	SW-846 3050B	10/08/24 PMX	SW846-7000B		1
Sample Comments:									
Client Sample ID: PCLA-11/2nd Floor 219 - Drywall - Black									**Date Sampled: 09/27/24**
Matrix: Chips									**LIMS Reference ID: AC32527-11**
Lead	<0.008 % wt	0.008 % wt	0.2633	10/07/24 KD1	SW-846 3050B	10/08/24 PMX	SW846-7000B		1
Sample Comments:									

EMSL Analytical, Inc.

200 Route 130, Cinnaminson, NJ, 08077
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EMSL-CIN-01

EMSL Order ID: 012432527
LIMS Reference ID: AC32527
EMSL Customer ID: ATC55

Attention: Steve Hudson
Atlas Technical [ATC55]
11117 Mockingbird Drive
Omaha, NE 68137
(402) 697-9747
steve.hudson@oneatlas.com

Project Name: Woodward Tunnel Survey 204BS07475
Customer PO:
EMSL Sales Rep: Anthony DeRosa
Received: 10/04/2024 10:00
Reported: 10/08/2024 15:01

Certified Analyses included in this Report

Analyte	Certifications
SW846-7000B in Chips	
Lead	AIHA LAP

List of Certifications

Code	Description	Number	Expires
NJDEP	New Jersey Department of Environmental Protection	03036	06/30/2025
AIHA LAP	EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC-ELLAP Accredited	100194	01/01/2025
NYSDOH	New York State Department of Health	10872	04/01/2025
California ELAP	California Water Boards	1877	06/30/2025
A2LA	A2LA Environmental Certificate	2845.01	07/31/2026
PADEP	Pennsylvania Department of Environmental Protection	68-00367	11/30/2024
MADEP	Massachusetts Department of Environmental Protection	M-NJ337	06/30/2025
CTDPH	Connecticut Department of Public Health	PH-0270	06/23/2026

Please see the specific Field of Testing (FOT) on www.emsl.com <http://www.emsl.com> for a complete listing of parameters for which EMSL is certified.

Notes and Definitions

Item	Definition
(Dig)	For metals analysis, sample was digested.
[2C]	Reported from the second channel in dual column analysis.
DF	Dilution Factor
MDL	Method Detection Limit.
ND	Analyte was NOT DETECTED at or above the detection limit.
NR	Spike/Surrogate showed no recovery.
Q	Qualifier
RL	Reporting Limit
	For paint chips, the RL is 0.008% by wt. (equiv. to 80 mg/kg, or ppm) based upon a minimum sample weight of 0.25 grams.
	For soils, the RL is 40 mg/kg (ppm) based upon a minimum sample weight of 0.5 grams.
	For dust wipes, the RL is 10 µg/wipe; reporting units of µg/sq. ft. are not validated by the lab based upon data provided by non-lab personnel.
Wet	Sample is not dry weight corrected.

Measurement of uncertainty and any applicable definitions of method modifications are available upon request. Per EPA NLLAP policy, sample results are not blank corrected.

EMSL Analytical, Inc.

200 Route 130, Cinnaminson, NJ, 08077
Telephone: 856-858-4800 Fax:856-786-5974
EMSL-CIN-01

EMSL Order ID: 012432527
LIMS Reference ID: AC32527
EMSL Customer ID: ATC55

Attention: Steve Hudson
Atlas Technical [ATC55]
11117 Mockingbird Drive
Omaha, NE 68137
(402) 697-9747
steve.hudson@oneatlas.com

Project Name: Woodward Tunnel Survey 204BS07475

Customer PO:
EMSL Sales Rep: Anthony DeRosa
Received: 10/04/2024 10:00
Reported: 10/08/2024 15:01



Owen McKenna Laboratory Manager or other approved signatory

EMSL maintains liability limited to cost of analysis. Interpretation and use of test results are the responsibility of the client. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. The report reflects the samples as received. Results are generated from the field sampling data (sampling volumes and areas, locations, etc.) provided by the client on the Chain of Custody. QC sample results are within quality control criteria and met method specifications unless otherwise noted. All results for soil samples are reported on a dry weight basis, unless otherwise noted.

Analysis following EMSL SOP for the Determination of Environmental Lead by FLAA. The laboratory has a reporting limit of 0.008% by wt., based upon a minimum sample weight of 0.25g submitted to the lab, and is not responsible for any result or reporting limit provided in mg/cm2 since it is dependent upon an area value provided by non-lab personnel. A "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty and definitions of modifications are available upon request. Results in this report are not blank corrected unless specified.

EMSL ANALYTICAL, INC.
TESTING LABS • PRODUCTS • TRAINING

Lead Chain of Custody

EMSL Order Number / Lab Use Only

AC32527

EMSL Analytical, Inc.
200 Route 130 North
Cinnaminson, NJ 08077

PHONE: (800) 220-3675
EMAIL: CinnaminsonLeadLab@emsl.com

Customer Information		Billing Information	
Customer ID:		Billing ID:	
Company Name:	Atlas Technical	Company Name:	Atlas Technical
Contact Name:	Steve Hudson	Billing Contact:	Steve Hudson
Street Address:	11117 Mockingbird Drive	Street Address:	11117 Mockingbird Drive
City, State, Zip:	Omaha, NE, 68137	Country: USA	Omaha, NE, 68137 Country: USA
Phone:	402-697-9747	Phone:	402-697-9747
Email(s) for Report:	steve.hudson@oneatlas.com	Email(s) for Invoice:	

Project Information

Project Name/No:	WOODWARD TUNNEL SURVEY	204B507475	Purchase Order:
EMSL LIMS Project ID: (If applicable, EMSL will provide)		US State where samples collected:	State of Connecticut (CT) must select project location: ☐ Commercial (Taxable) ☐ Residential (Non-Taxable)
Sampled By Name:	ERIC BROWN	Sampled By Signature:	Eric Brown — No. of Samples in Shipment: 11

Turn-Around-Time (TAT)

☐ 3 Hour ☐ 6 Hour ☐ 24 Hour ☐ 32 Hour ☒ 48 Hour ☐ 72 Hour ☐ 96 Hour ☐ 1 Week ☐ 2 Week

Please call ahead for large projects and/or turnaround times 6 Hours or Less. *32 Hour TAT available for select tests only; samples must be submitted by 11:30am.

MATRIX	METHOD	INSTRUMENT	REPORTING LIMIT	SELECTION
CHIPS ☒ % by wt. ☐ ppm (mg/kg) ☐ mg/cm² *Reporting Limit based on a minimum 0.25g sample weight. **Not appropriate for Ceramic Tiles - XRF is recommended	SW 846-7000B	Flame Atomic Absorption	0.008% (80ppm)	☒
	SW 846-6010D*	ICP-OES	0.0004% (4ppm)	☐
AIR	NIOSH 7082	Flame Atomic Absorption	4µg/filter	☐
	NIOSH 7303M	ICP-OES	1.0µg/filter	☐
	NIOSH 7303M	ICP-MS	0.05µg/filter	☐
WIPE ☐ ASTM ☐ NON-ASTM *If no box is checked, non-ASTM Wipe is assumed	SW 846-7000B	Flame Atomic Absorption	10µg/wipe	☐
	SW 846-6010D*	ICP-OES	1.0µg/wipe	☐
TCLP	SW 846-1311 / 7000B / SM 3111B	Flame Atomic Absorption	0.4 mg/L (ppm)	☐
	SW 846-1311 / SW 846-6010D*	ICP-OES	0.1 mg/L (ppm)	☐
SPLP	SW 846-1312 / 7000B / SM 3111B	Flame Atomic Absorption	0.4 mg/L (ppm)	☐
	SW 846-1312 / SW 846-6010D*	ICP-OES	0.1 mg/L (ppm)	☐
TTLC	22 CCR App. II, 7000B	Flame Atomic Absorption	40mg/kg (ppm)	☐
	22 CCR App. II, SW 846-6010D*	ICP-OES	2mg/kg (ppm)	☐
STLC	22 CCR App. II, 7000B	Flame Atomic Absorption	0.4 mg/L (ppm)	☐
	22 CCR App. II, SW 846-6010D*	ICP-OES	0.1 mg/L (ppm)	☐
Soil	SW 846-7000B	Flame Atomic Absorption	40mg/kg (ppm)	☐
	SW 846-6010D*	ICP-OES	2mg/kg (ppm)	☐
Wastewater	SM 3111B / SW 846-7000B	Flame Atomic Absorption	0.4 mg/L (ppm)	☐
Unpreserved ☐ / Preserved with HNO3 ☐ PH<2	EPA 200.7	ICP-OES	0.020 mg/L (ppm)	☐
Drinking Water	EPA 200.5	ICP-OES	0.003 mg/L (ppm)	☐
Unpreserved ☐ / Preserved with HNO3 ☐ PH<2	EPA 200.8	ICP-MS	0.001 mg/L (ppm)	☐
TSP/SPM Filter	40 CFR Part 50	ICP-OES	12 µg/filter	☐
Other:				☐

Sample Number	Sample Location	Volume / Area	Date / Time Sampled
	SEE OTHER SHEETS		

Method of Shipment:		Sample Condition Upon Receipt:	
Relinquished by: Eric Brown	Date/Time: 10/3/24 17:00	Received by: RJA EFX	Date/Time: 10/4/24 10AM
Relinquished by:	Date/Time:	Received by:	Date/Time

Controlled Document - COC-25 Lead R18 04/04/2024

*6010C Available Upon Request

☐ AGREE TO ELECTRONIC SIGNATURE (By checking, I consent to signing this Chain of Custody document by electronic signature.)

EMSL Analytical, Inc.'s Laboratory Terms and Conditions are incorporated into this Chain of Custody by reference in their entirety. Submission of samples to EMSL Analytical, Inc. constitutes acceptance and acknowledgment of all terms and conditions by Customer.

11 BD

AC32527

PAINT CHIP SAMPLE LOG SHEET

ATLAS
11117 Mockingbird Drive
Omaha, NE 68137
Phone (402) 697-9747

Project Information

Client:	Project Description: LINDEN A & B	Project Manager: SH Inspector: EB
Date: 9/27/24	Site Location: WOODWARD	ATLAS PROJECT NUMBER: 204BS07475

Sample #	Paint Color	Substrate	Sample Location		Quantity
PCLA-1	WHITE	CONCRETE	BASEMENT	B01	
PCLA-2	V. LT BLUE	"	"	"	
PCLA-3	LT. GREEN	"	"	"	
PCLA-4	LT. PEACH	CONCRETE	"	B10	
PCLA-5	GREEN	BRICK	1ST FLOOR	B126	
PCLA-6	LT. BLUE	BRICK	1ST	B138	
PCLA-7	Black	Metal	2nd	220	
PCLA-8	Gray	metal	2nd	216	
PCLA-9	White	metal	2nd	216	
PCLA-10	White	Plaster	2nd	210	

BD

AC32527

PAINT CHIP SAMPLE LOG SHEET

ATLAS
11117 Mockingbird Drive
Omaha, NE 68137
Phone (402) 697-9747

Project Information

Client:	Project Description: Linden A + B	Project Manager: Inspector: EB
Date: 9/30/24	Site Location: Woodward	ATLAS PROJECT NUMBER: 204BS0 7475

Sample #	Paint Color	Substrate	Sample Location	Quantity
PCLA-11	Black	Drywall	2nd - 219	

EMSL ANALYTICAL, INC.
TESTING LABS • PRODUCTS • TRAINING

Lead Chain of Custody

EMSL Order Number / Lab Use Only

AC32527

EMSL Analytical, Inc.
200 Route 130 North
Cinnaminson, NJ 08077

PHONE: (800) 220-3675
EMAIL: CinnaminsonLeadLab@emsl.com

Customer Information		Billing Information	
Customer ID:		Billing ID:	
Company Name:	Atlas Technical	Company Name:	Atlas Technical
Contact Name:	Steve Hudson	Billing Contact:	Steve Hudson
Street Address:	11117 Mockingbird Drive	Street Address:	11117 Mockingbird Drive
City, State, Zip:	Omaha, NE, 68137	City, State, Zip:	Omaha, NE, 68137
Country:	USA	Country:	USA
Phone:	402-697-9747	Phone:	402-697-9747
Email(s) for Report:	steve.hudson@oneatlas.com	Email(s) for Invoice:	

Project Information

Project Name/No:	WOODWARD TUNNEL SURVEY	204B507475	Purchase Order:
EMSL LIMS Project ID: (If applicable, EMSL will provide)		US State where samples collected:	State of Connecticut (CT) must select project location: ☐ Commercial (Taxable) ☐ Residential (Non-Taxable)
Sampled By Name:	ERIC BROWN	Sampled By Signature:	Eric Brown
No. of Samples in Shipment	11		

Turn-Around-Time (TAT)

☐ 3 Hour ☐ 6 Hour ☐ 24 Hour ☐ 32 Hour ☒ 48 Hour ☐ 72 Hour ☐ 96 Hour ☐ 1 Week ☐ 2 Week

Please call ahead for large projects and/or turnaround times 6 Hours or Less. *32 Hour TAT available for select tests only; samples must be submitted by 11:30am.

MATRIX	METHOD	INSTRUMENT	REPORTING LIMIT	SELECTION
CHIPS ☒ % by wt. ☐ ppm (mg/kg) ☐ mg/cm² *Reporting Limit based on a minimum 0.25g sample weight. **Not appropriate for Ceramic Tiles - XRF is recommended	SW 846-7000B	Flame Atomic Absorption	0.008% (80ppm)	☒
	SW 846-6010D*	ICP-OES	0.0004% (4ppm)	☐
AIR	NIOSH 7082	Flame Atomic Absorption	4µg/filter	☐
	NIOSH 7303M	ICP-OES	1.0µg/filter	☐
	NIOSH 7303M	ICP-MS	0.05µg/filter	☐
WIPE ☐ ASTM ☐ NON-ASTM *If no box is checked, non-ASTM Wipe is assumed	SW 846-7000B	Flame Atomic Absorption	10µg/wipe	☐
	SW 846-6010D*	ICP-OES	1.0µg/wipe	☐
TCLP	SW 846-1311 / 7000B / SM 3111B	Flame Atomic Absorption	0.4 mg/L (ppm)	☐
	SW 846-1311 / SW 846-6010D*	ICP-OES	0.1 mg/L (ppm)	☐
SPLP	SW 846-1312 / 7000B / SM 3111B	Flame Atomic Absorption	0.4 mg/L (ppm)	☐
	SW 846-1312 / SW 846-6010D*	ICP-OES	0.1 mg/L (ppm)	☐
TTLC	22 CCR App. II, 7000B	Flame Atomic Absorption	40mg/kg (ppm)	☐
	22 CCR App. II, SW 846-6010D*	ICP-OES	2mg/kg (ppm)	☐
STLC	22 CCR App. II, 7000B	Flame Atomic Absorption	0.4 mg/L (ppm)	☐
	22 CCR App. II, SW 846-6010D*	ICP-OES	0.1 mg/L (ppm)	☐
Soil	SW 846-7000B	Flame Atomic Absorption	40mg/kg (ppm)	☐
	SW 846-6010D*	ICP-OES	2mg/kg (ppm)	☐
Wastewater	SM 3111B / SW 846-7000B	Flame Atomic Absorption	0.4 mg/L (ppm)	☐
Unpreserved ☐ / Preserved with HNO3 ☐ PH<2	EPA 200.7	ICP-OES	0.020 mg/L (ppm)	☐
Drinking Water	EPA 200.5	ICP-OES	0.003 mg/L (ppm)	☐
Unpreserved ☐ / Preserved with HNO3 ☐ PH<2	EPA 200.8	ICP-MS	0.001 mg/L (ppm)	☐
TSP/SPM Filter	40 CFR Part 50	ICP-OES	12 µg/filter	☐
Other:				☐

Sample Number	Sample Location	Volume / Area	Date / Time Sampled
	SEE OTHER SHEETS		

Method of Shipment:		Sample Condition Upon Receipt:	
Relinquished by:	Eric Brown	Received by:	RJA EFX
Date/Time:	10/3/24 17:00	Date/Time:	10/4/24 10AM
Relinquished by:		Received by:	
Date/Time:		Date/Time	

Controlled Document - COC-25 Lead R18 04/04/2024

*6010C Available Upon Request

☐ AGREE TO ELECTRONIC SIGNATURE (By checking, I consent to signing this Chain of Custody document by electronic signature.)

EMSL Analytical, Inc.'s Laboratory Terms and Conditions are incorporated into this Chain of Custody by reference in their entirety. Submission of samples to EMSL Analytical, Inc. constitutes acceptance and acknowledgment of all terms and conditions by Customer.

11 BD

AC32527

PAINT CHIP SAMPLE LOG SHEET

ATLAS
11117 Mockingbird Drive
Omaha, NE 68137
Phone (402) 697-9747

Project Information

Client:	Project Description: LINDEN A & B	Project Manager: SH Inspector: EB
Date: 9/27/24	Site Location: WOODWARD	ATLAS PROJECT NUMBER: 204BS07475

Sample #	Paint Color	Substrate	Sample Location	Quantity
PCLA-1	WHITE	CONCRETE	BASEMENT B01	
PCLA-2	V. LT BLUE	"	" "	
PCLA-3	LT. GREEN	"	" "	
PCLA-4	LT. PEACH	CONCRETE	" B10	
PCLA-5	GREEN	BRICK	1ST FLOOR B126	
PCLA-6	LT. BLUE	BRICK	1ST B138	
PCLA-7	Black	Metal	2nd 220	
PCLA-8	Gray	metal	2nd 216	
PCLA-9	White	metal	2nd 216	
PCLA-10	White	Plaster	2nd 210	

BD

AC32527

PAINT CHIP SAMPLE LOG SHEET

ATLAS
11117 Mockingbird Drive
Omaha, NE 68137
Phone (402) 697-9747

Project Information

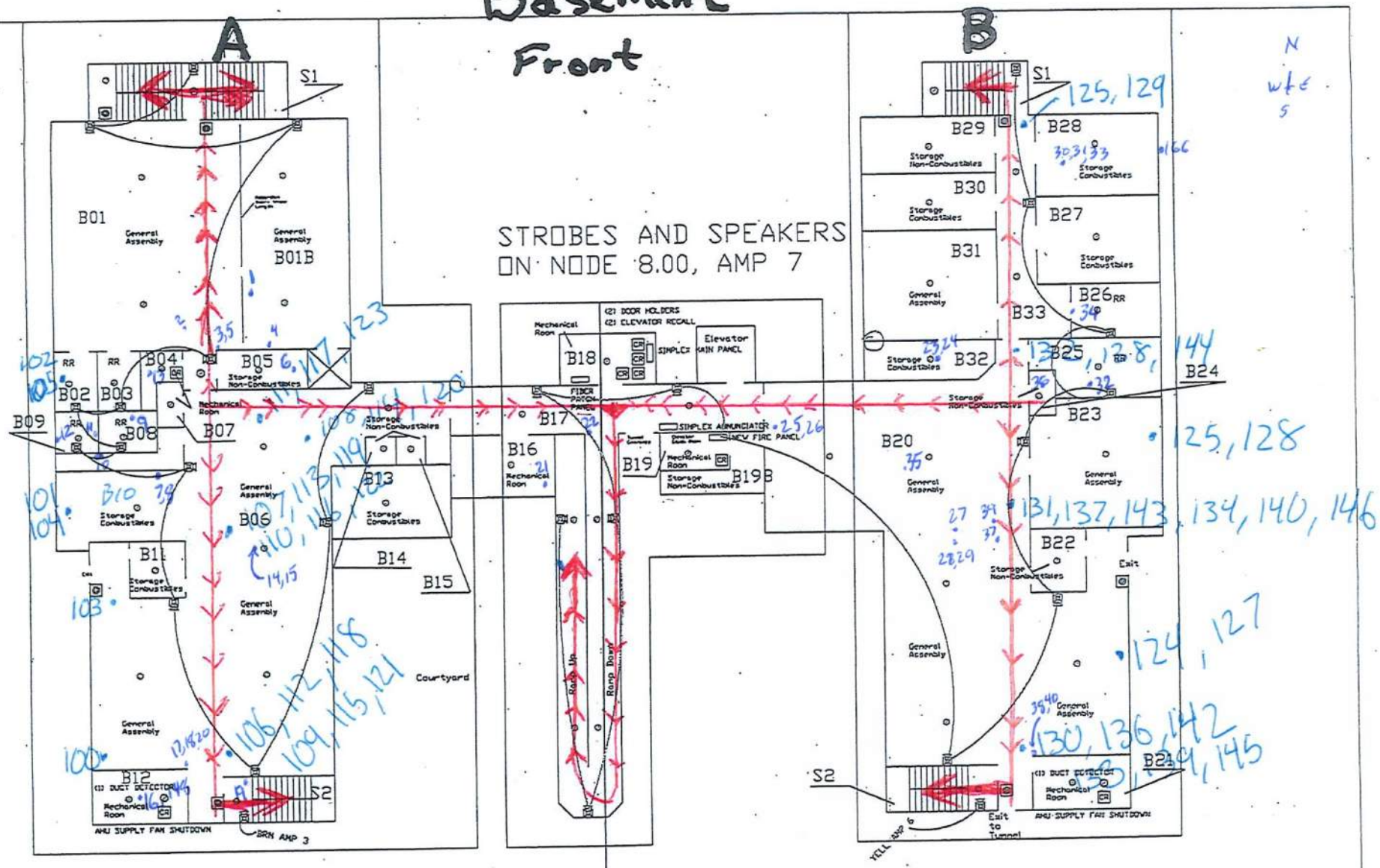
Client:	Project Description: Linden A + B	Project Manager: Inspector: EB
Date: 9/30/24	Site Location: Woodward	ATLAS PROJECT NUMBER: 204BS0 7475

Sample #	Paint Color	Substrate	Sample Location	Quantity
PCLA-11	Black	Drywall	2nd - 219	

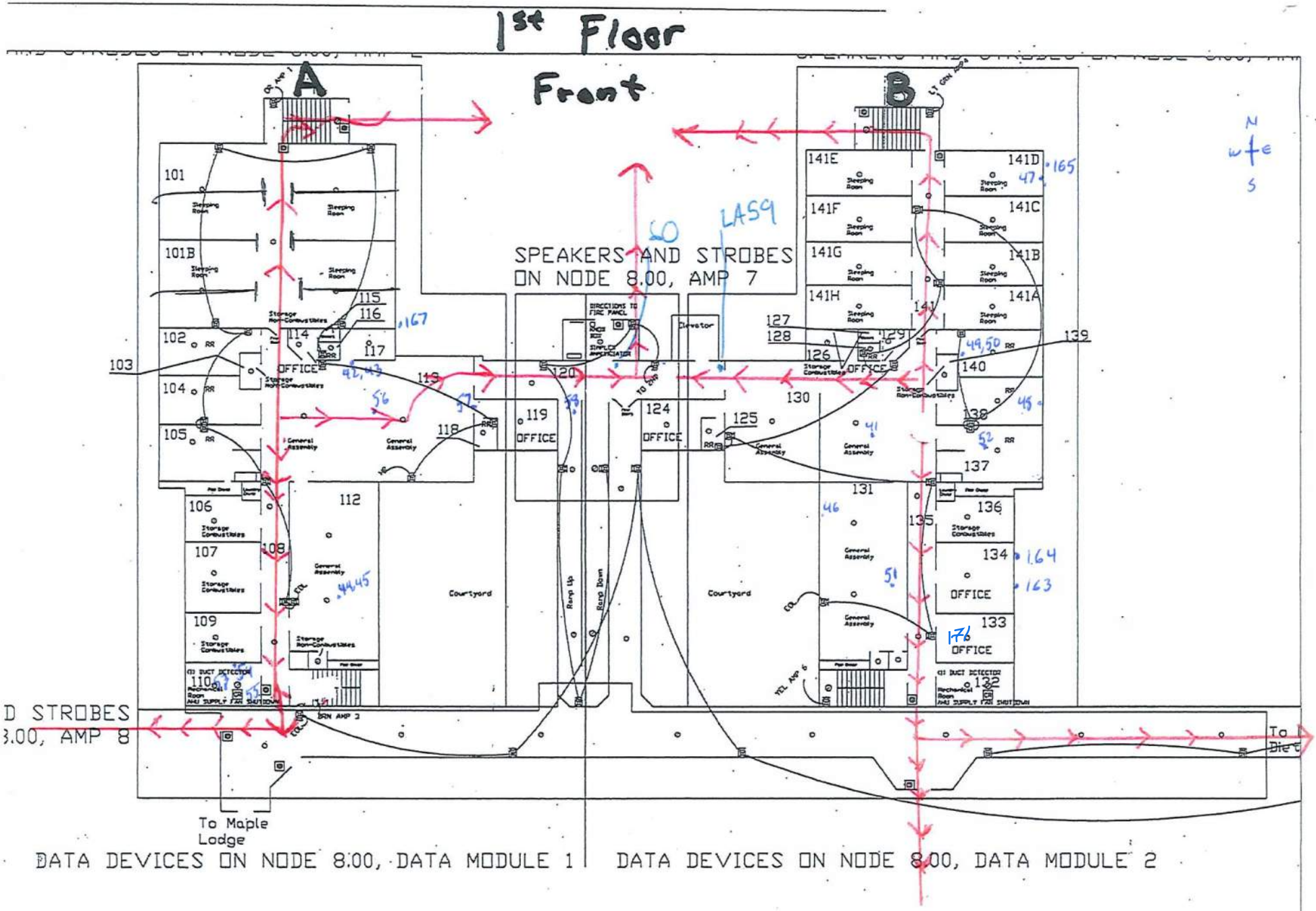
APPENDIX C

DRAWINGS WITH SAMPLE LOCATIONS

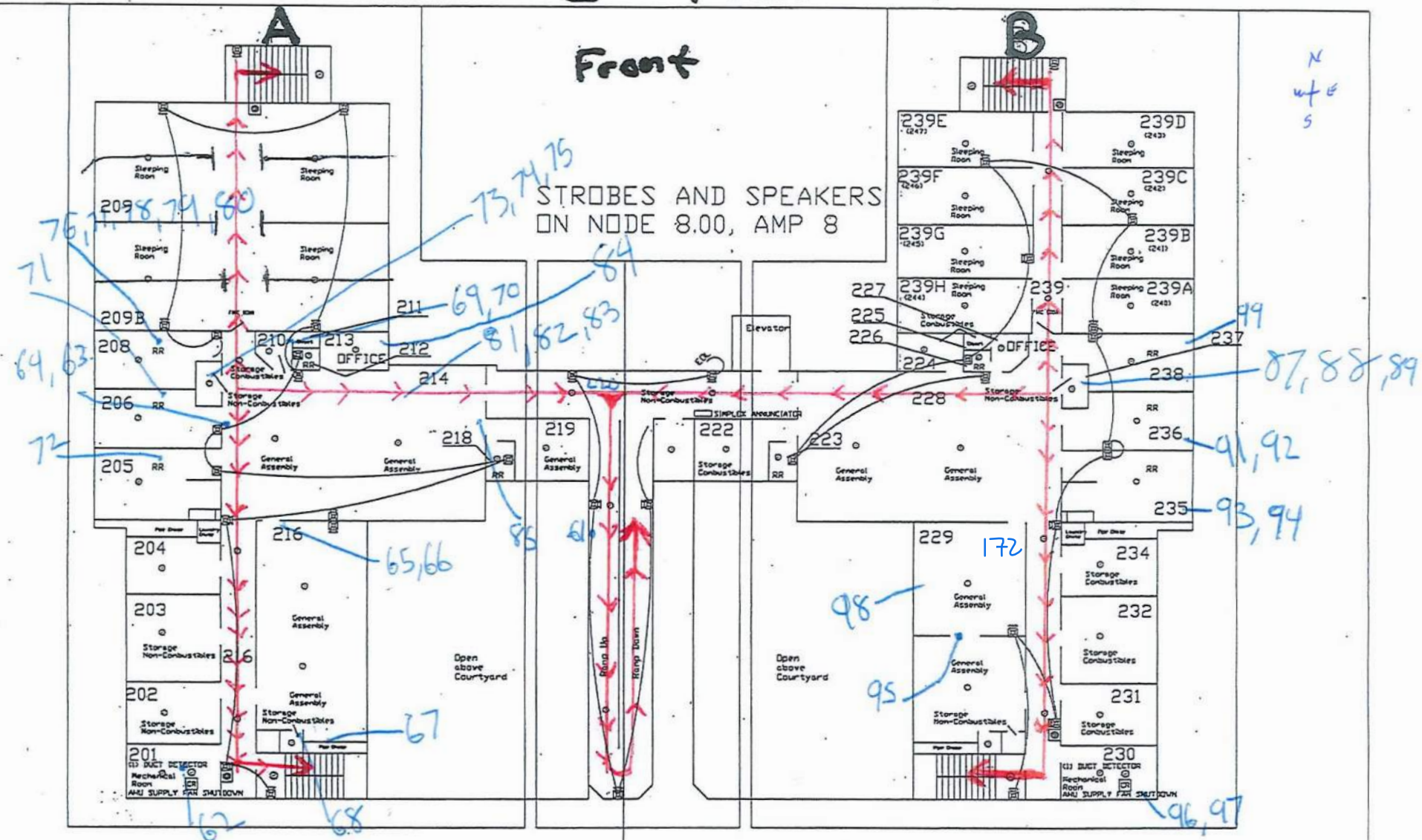
Basement Front



LINDEN COURT A&B


1st Floor
Front
A
B
SPEAKERS AND STROBES
ON NODE 8.00, AMP 7
D STROBES
3.00, AMP 8
To Maple
Lodge
DATA DEVICES ON NODE 8.00, DATA MODULE 1
DATA DEVICES ON NODE 8.00, DATA MODULE 2
LINDEN COURT A&B
SCALE: 1"-0" = 1/16"

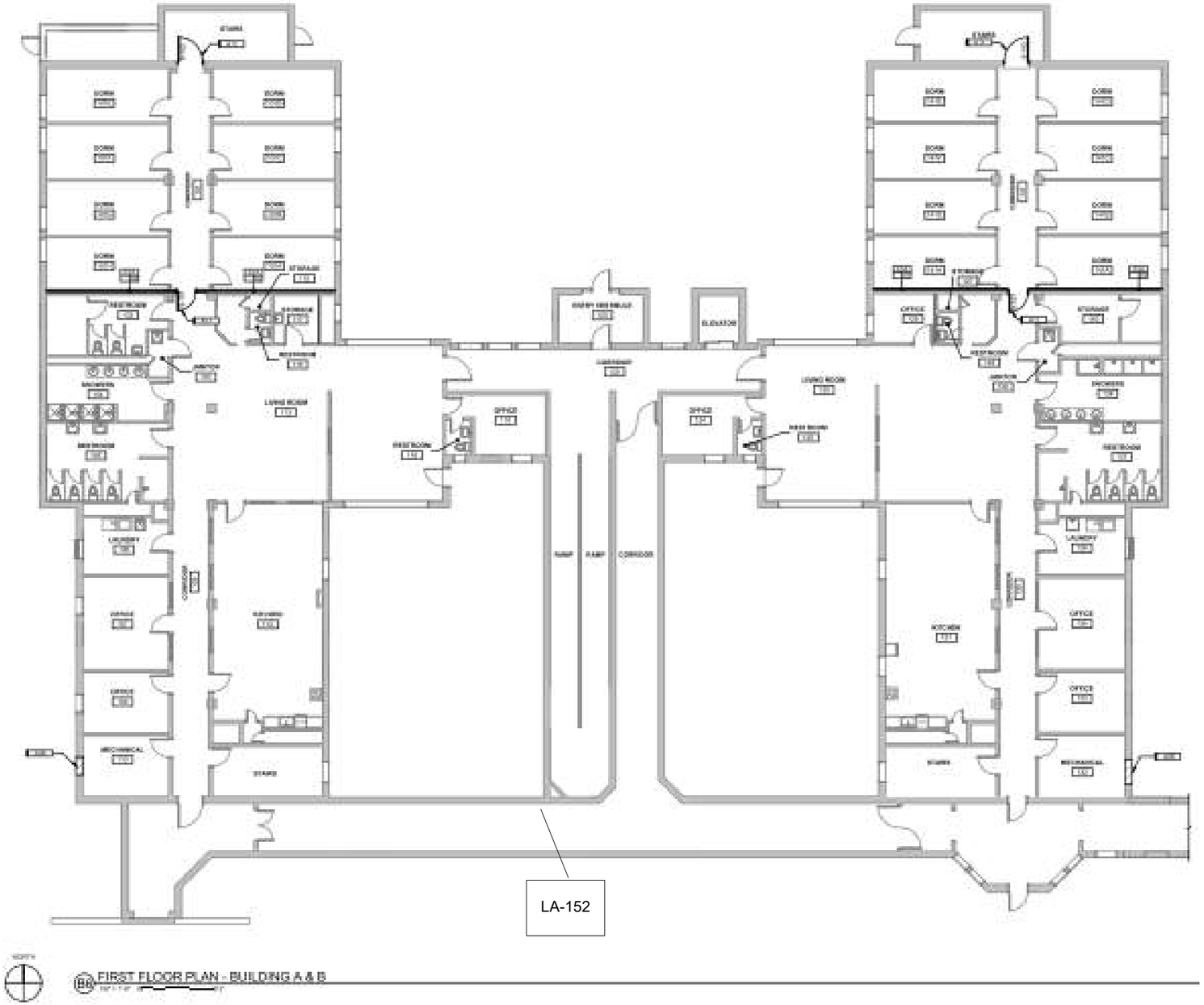
2nd Floor



DATA DEVICES ON NODE 8.00, DATA MODULE 1 | DATA DEVICES ON NODE 8.00, DATA MODULE 2

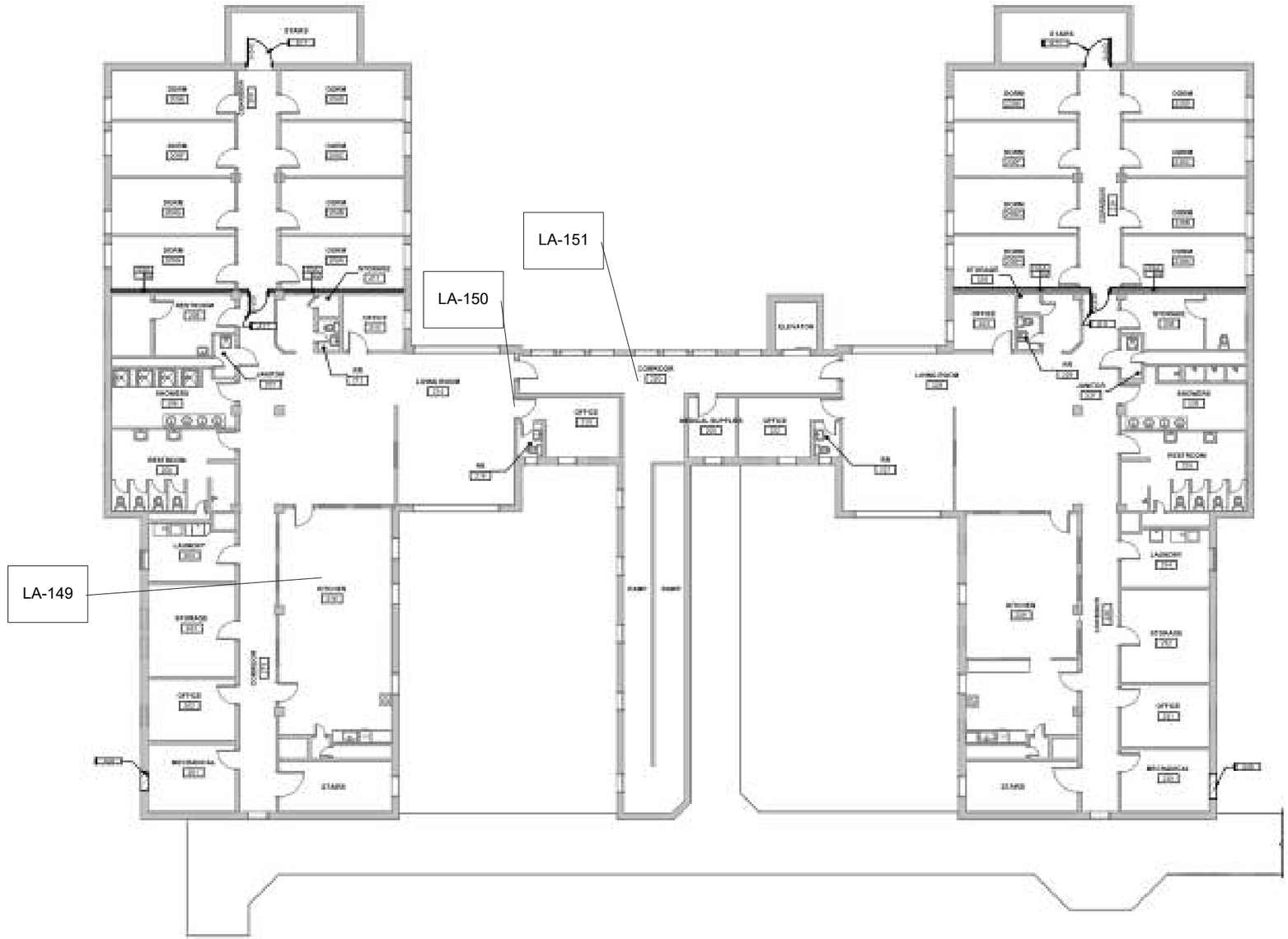
LINDEN COURT A&B

XX-XX = Sample Location



FIRST FLOOR PLAN - BUILDING A & B

Project No. 204BS09286	Date: December 30, 2025	ATLAS 11117 Mockingbird Drive Omaha, NE 68137 PH. (402) 697-9747	**Asbestos Sample Locations** Linden Court A/B Building 1251 334th Street Woodward, IA 50276
Project Manager: Phillip Thomas			
Name: 1st Floor			



XX-XX = Sample Location

SECOND FLOOR PLAN - BUILDING A & B

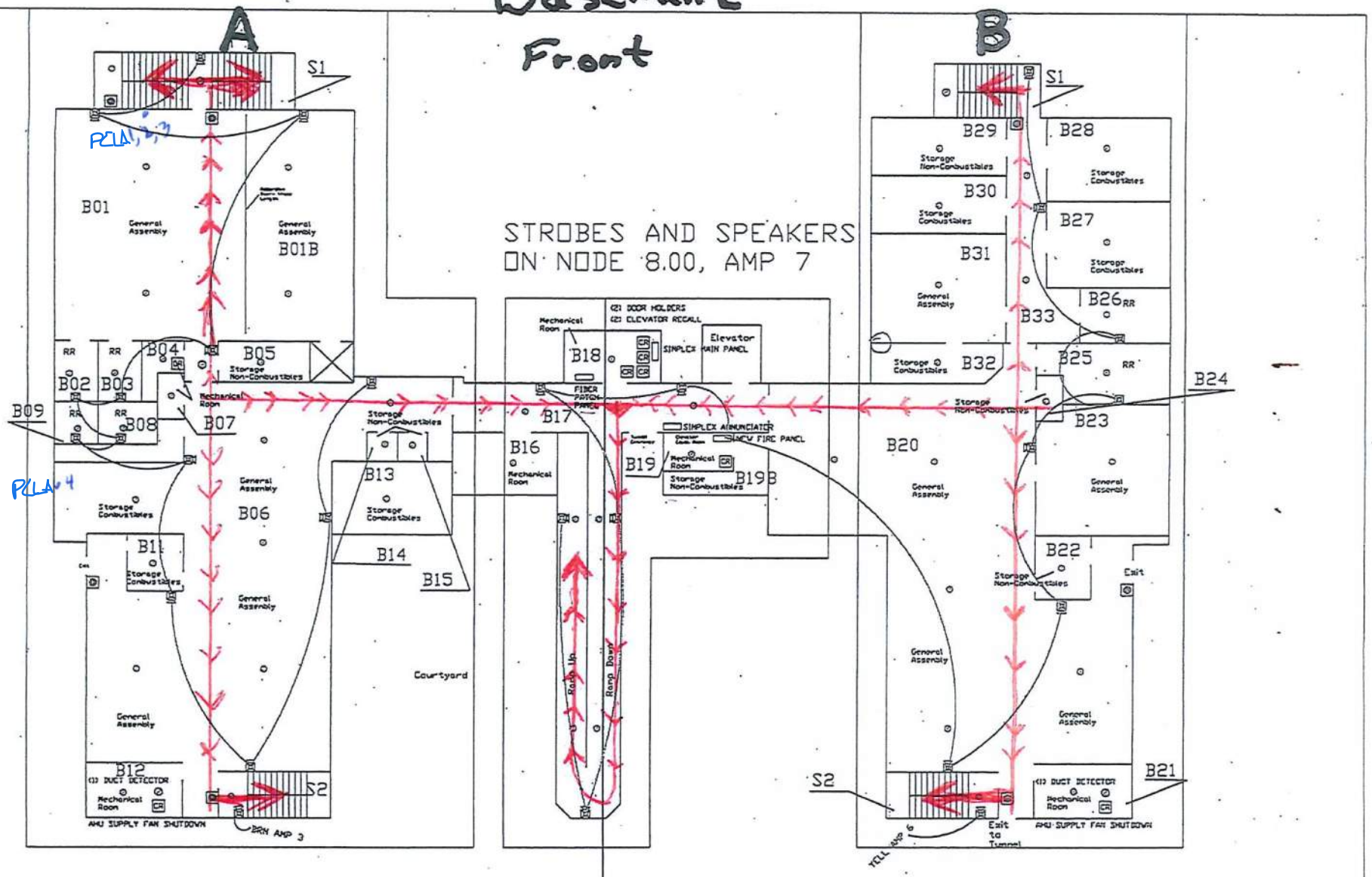
Project No. 204BS09286	Date: December 30, 2025
Project Manager: Phillip Thomas	
Name: 2nd Floor	

ATLAS
11117 Mockingbird Drive
Omaha, NE 68137
PH. (402) 697-9747

Asbestos Sample Locations

Linden Court A/B Building
1251 334th Street
Woodward, IA 50276

Basement Front

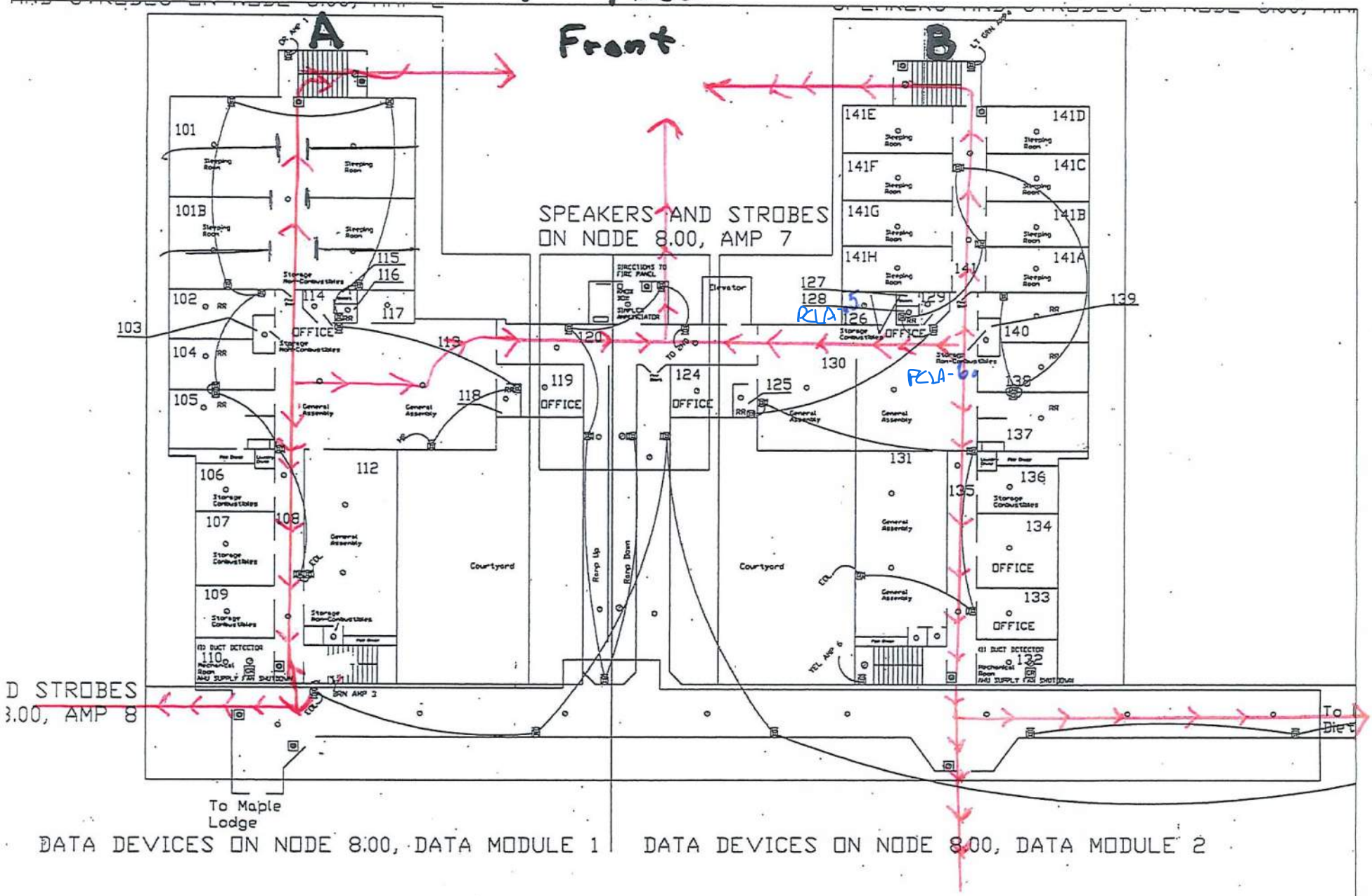


DATA DEVICES ON NODE 8.00, DATA MODULE 1 | DATA DEVICES ON NODE 8.00, DATA MODULE 2

LINDEN COURT A&B

1st Floor

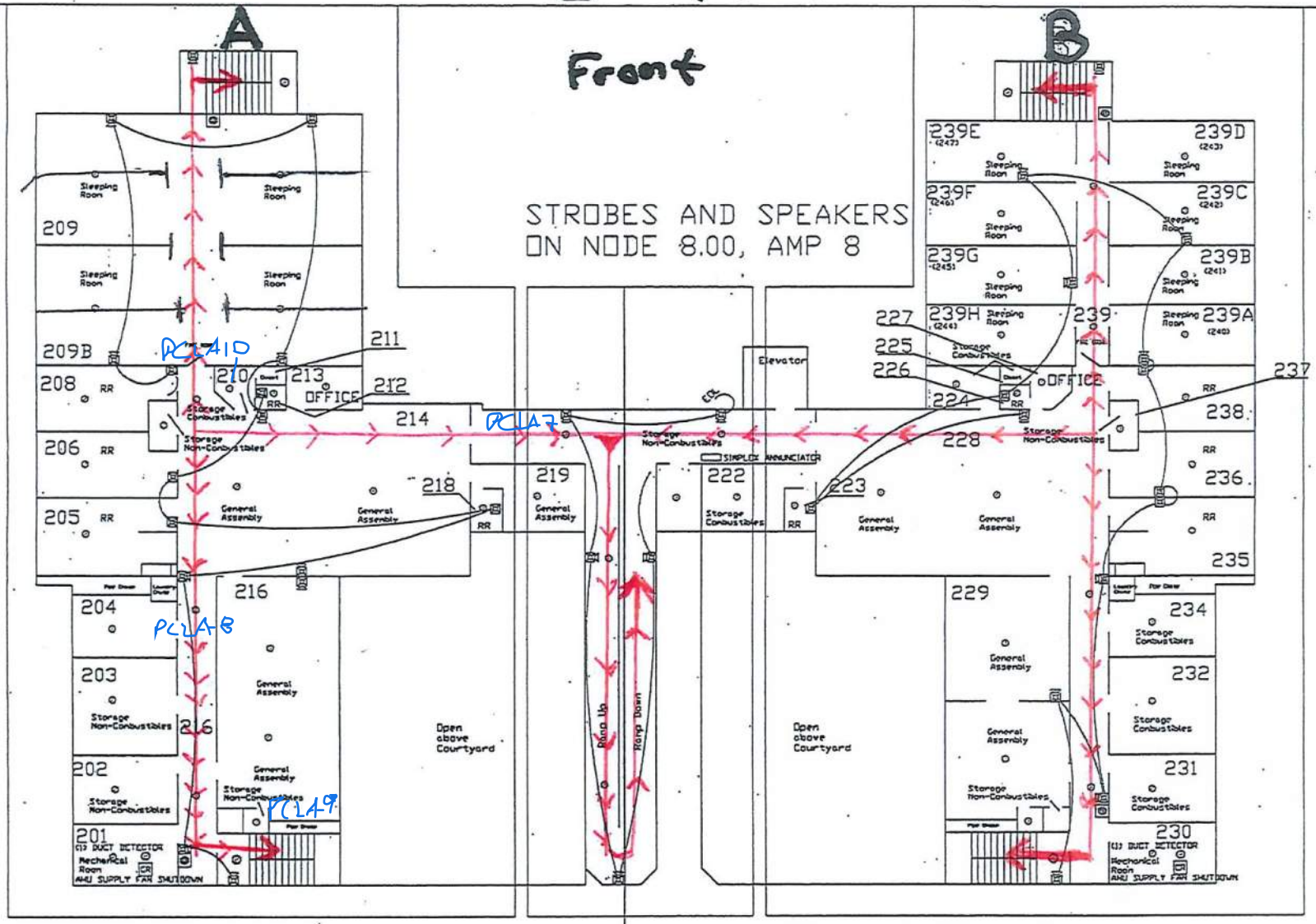
Front



LINDEN COURT A&B

SCALE: 1'-0" = 1/16"

2nd Floor



DATA DEVICES ON NODE 8.00, DATA MODULE 1 | DATA DEVICES ON NODE 8.00, DATA MODULE 2

LINDEN COURT A&B

APPENDIX D

ASBESTOS AND LEAD PAINT PHOTO LOGS



View of the Linden A & B.

1



View of the Asbestos Containing sink insulation (purple). (LA-9, 8% Chrysotile)

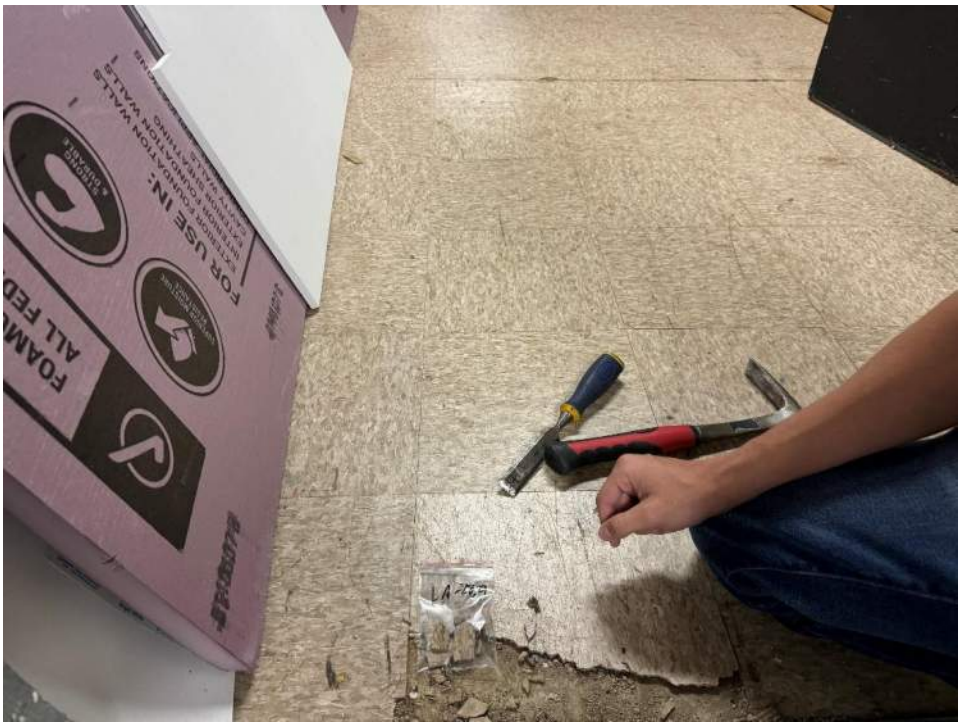
2

Photograph Log Linden A & B 1251 334th Street Woodward, Iowa Project No. 204BS09286	**Atlas Technical Consultants LLC** 4503 East 50th Street, Suite 800, Des Moines, IA 50317 (515) 981-4528



View of the Asbestos Containing Sheet Flooring Mastic. (LA-24, 13% Chrysotile)

3



View of the Asbestos Containing VFT Mastic. (LA-29, 6% Chrysotile)

4

Photograph Log Linden A & B 1251 334th Street Woodward, Iowa Project No. 204BS09286	**Atlas Technical Consultants LLC** 4503 East 50th Street, Suite 800, Des Moines, IA 50317 (515) 981-4528



View of the Asbestos Containing Green Sheet Flooring and Mastic.
(LA-30 & 31, 22% & 7% Chrysotile)

5



View of the Asbestos Containing Sheet Flooring Mastic.
(LA-43, 2% Anthophyllite)

6

Photograph Log	**Atlas Technical Consultants LLC**
Linden A & B 1251 334th Street Woodward, Iowa Project No. 204BS09286	4503 East 50th Street, Suite 800, Des Moines, IA 50317 (515) 981-4528



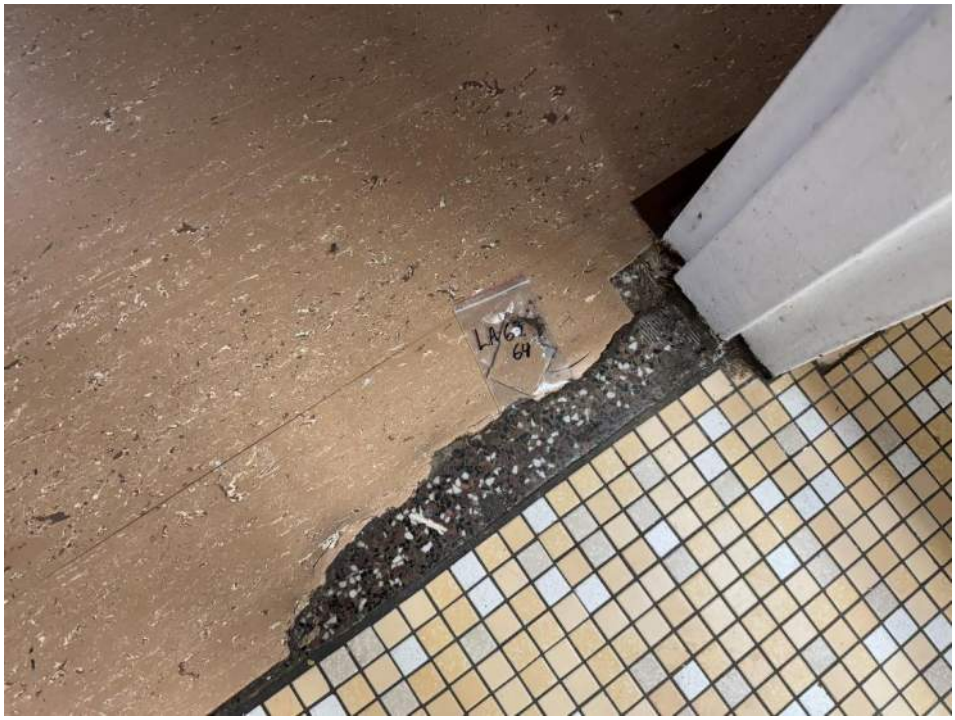
View of the Asbestos Containing Sheet Flooring Mastic. (LA-45, 3% Anthpyllite)

7



View of the Asbestos Containing Plaster. (LA-51 & 58, 6% Chrysotile)

8



View of the Asbestos Containing Sheet Flooring Mastic.
(LA-64, 2% Anthophyllite)

9



View of the Asbestos Containing Sheet Flooring Mastic. (LA-66, 3% Anthophyllite)

10



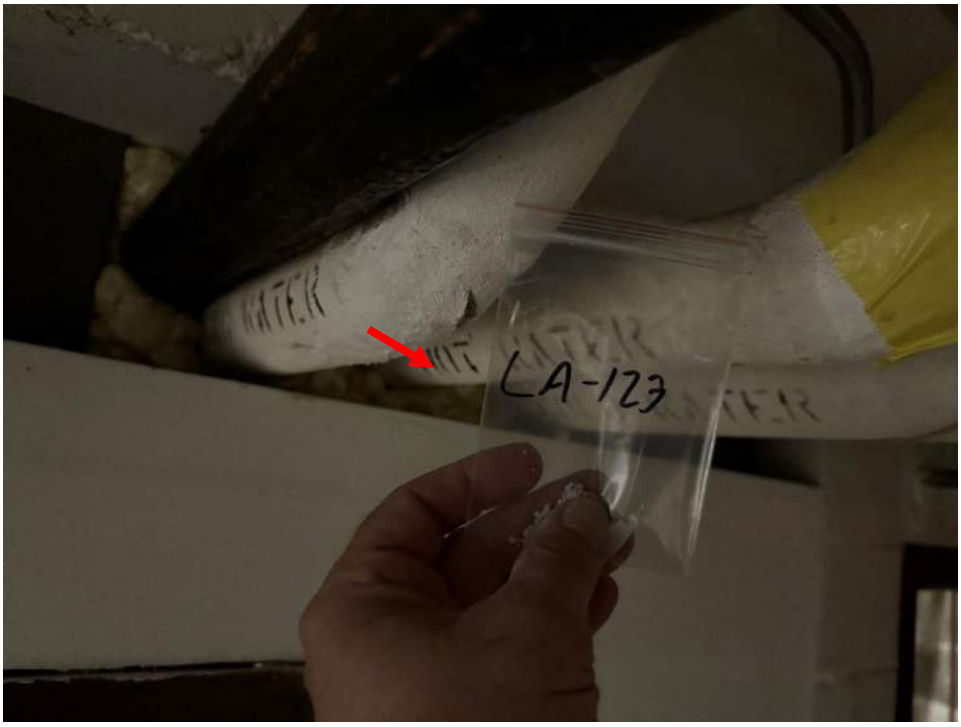
View of the Asbestos Containing White Caulk. (LA-80, <1% Anthophyllite)

11



View of the Asbestos Containing Window Glazing. (LA-82, 2% Chrysotile)

12



View of the Asbestos Containing TSI Circulating Water Elbow (A Wing).
(LA-121, 122, 123, 33%-40% Chrysotile)

13



View of the Asbestos Containing TSI Circulating Water Elbow (B Wing).
(LA-145, 146, 147, 36%-40% Chrysotile)

14



View of the Asbestos Containing Acoustical Texture Ceiling.
(LA-149, 6-8% Chrysotile)

15



View of the Asbestos Containing Acoustical Texture Ceiling.
(LA-151, 6-8% Chrysotile)

16

APPENDIX E

INSPECTOR ACCREDITATIONS

ERIC BROWN

DOB: 05-07-1970

Issued: 02-27-2024



This person is licensed to perform asbestos work in the State of Iowa. ID card is intended for official use only and must be present on jobsite.

License Type	Number	Expires
INSPECTOR	24-11418	02-09-2025

IOWA

Asbestos

Larry Johnson, Jr.
Labor Commissioner

CHRISTOPHER NICOLET



DOB: 05-24-1995

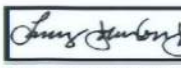
Issued: 01-15-2025

This person is licensed to perform asbestos work in the State of Iowa. ID card is intended for official use only and must be present on jobsite.

License Type	Number	Expires
INSPECTOR	25-12809	12-20-2025

IOWA

Asbestos



Larry Johnson, Jr.
Labor Commissioner

PHILLIP THOMAS

DOB: 05-26-1976

Issued: 01-15-2025



This person is licensed to perform asbestos work in the State of Iowa. ID card is intended for official use only and must be present on jobsite.

License Type	Number	Expires
INSPECTOR	25-12849	01-06-2026
PROJECT DESIGNER	25-12850	01-06-2026
MANAGEMENT PLANNER	25-12851	01-07-2026

IOWA

Asbestos

Larry Johnson, Jr.
Labor Commissioner

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HAZARDOUS BUILDING MATERIALS SURVEY – REVISED

PREPARED FOR:

Iowa Department of Administrative Services
109 SE 13th Street
Des Moines, Iowa 50319

PROJECT LOCATION:

Woodward Resource Center – Phase 4 Decentralization Project #9279
Linden Court Buildings C & D
1251 334th Street
Woodward, Iowa

Project Dates: October 2, 4, September 27, November 20, 2024 and December 12 and 22, 2025

Report Date: December 30, 2025

Atlas Project ID: 204BS09286

PREPARED BY:

Atlas Technical Consultants LLC
4503 East 50th Street, Suite 800
Des Moines, IA 50317

December 30, 2025

Ms. Jennifer Kleene
Iowa Department of Administrative Services
109 SE 13th Street
Des Moines, IA 50319

Re: Hazardous Building Materials Survey – Linden Court Buildings C & D – REVISED
Woodward Resource Center – Phase 4 Decentralization Project #9279
1251 334th Street
Woodward, Iowa 50276
Atlas Project Number: 204BS09286

Atlas is pleased to submit the attached Hazardous Building Materials Survey Report for the above-referenced site. This report includes procedures, methodologies and analytical laboratory results.

Atlas appreciates the opportunity to perform these services for the Iowa Department of Administrative Services (IDAS), and we look forward to working with you in the future. If you need any assistance with the implementation of the recommendations contained in this report, please feel free to give us a call at (515) 981-4528 and we will respond promptly to your needs.

Sincerely,

ATLAS TECHNICAL CONSULTANTS LLC

Chris Nicolet
Iowa Inspector

Phillip Thomas, OHST
Senior Project Manager

T A B L E O F C O N T E N T S

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HAZARDOUS BUILDING MATERIALS SURVEY REPORT – REVISED

Woodward Resource Center – Linden Court Buildings C & D
Phase 4 Decentralization Project #9279
1251 334th Street
Woodward, Iowa
Atlas Project Number: 204BS09286

1.0 SCOPE OF SERVICES

The purpose of this project was to perform a survey to identify hazardous building materials (HBM) at the above-referenced property.

Atlas provided a representative asbestos survey in accordance with the referenced agreement and as outlined below:

1. Review any existing hazardous building material survey reports relating to the site, if available.
2. Identify suspect asbestos-containing materials (ACM), surface coatings potentially containing lead paint, and hazardous building materials throughout the interior and exterior of the building, not including the roof.
3. Collect and analyze bulk samples of suspect asbestos containing materials and collect paint chip samples from representative surface coatings potentially containing lead-based or lead-containing paint.
4. Provide laboratory analysis of collected samples.
5. Provide a report of findings with copies and interpretation of analytical results and identifying the locations of asbestos-containing materials, lead paint, and hazardous building materials.

2.0 GENERAL SITE CONDITIONS

The survey was conducted at the Woodward Resource Center – Linden Court Buildings C & D located at 1251 334th Street in Woodward, Iowa. The survey was limited to accessible surfaces on the interior and exterior of the building, not including the roof.

3.0 ASBESTOS SURVEY

On October 2, 4, September 27, November 20, 2024 and December 12 and 22, 2025, Linden Court Buildings C & D were inspected for ACM by inspectors Mr. Eric Brown, Chris Nicolet and Phillip Thomas of Atlas. Atlas inspectors have completed the requisite training for asbestos accreditation as inspectors at a state approved training provider under TSCA Title II.

Accessible areas were visually inspected for the presence of suspect ACM. Materials that were hidden, not accessible, or when sampled would damage the integrity of the structure, were not sampled as part of this survey. Materials visibly identified as non-asbestos (fibrous glass, foam

rubber, wood, etc.) were not sampled. The asbestos survey consisted of three basic steps: **1)** a visual inspection of the proposed work areas; **2)** a determination of homogeneous areas with suspect surfacing, thermal system insulation, and miscellaneous materials; and **3)** sampling accessible, friable and non-friable, suspect materials.

3.1 Regulation Review

The United States Environmental Protection Agency (USEPA) qualifies ACM as materials with an asbestos content greater than 1%. The following definitions are taken from Section 61.141 of Subpart M, Part 61 of Title 40: Protection of Environment of the Code of Federal Regulations (CFR).

- "Category I non-friable ACM" is defined as asbestos-containing packings, gaskets, resilient floor covering, and asphalt roofing products containing more than 1% asbestos as determined using the method specified in appendix E, subpart E, 40 CFR part 763, section 1, Polarized Light Microscopy (PLM).

- "Category II non-friable ACM" is defined as any material, excluding Category I non-friable ACM, containing more than 1% asbestos as determined using the methods specified in appendix E, subpart E, 40 CFR part 763, section 1, PLM that, when dry, ***cannot*** be crumbled, pulverized, or reduced to powder by hand pressure.

- "Friable asbestos material" is defined as any material containing more than 1% asbestos as determined using the methods specified in appendix E, subpart E, 40 CFR part 763, section 1, PLM that when dry, ***can*** be crumbled, pulverized, or reduced to powder by hand pressure. If the asbestos content is less than 10% as determined by a method other than point counting by PLM, verify the asbestos content by point counting using PLM.

3.2 Homogeneous Areas

Prior to sampling, homogeneous areas were identified in order to facilitate a sampling strategy. A homogeneous sampling area can be described as one or more areas with suspect material similar in appearance and texture that have the same installation date and function. The actual number of samples collected from each homogeneous sampling area may vary, dependent upon material type and the professional judgment of the inspector.

3.3 Sampling Strategy

The sampling strategy incorporated Asbestos Hazard Emergency Response Acts (AHERA) requirements, quantities of suspect material, and the inspector's judgment to aid in the identification of suspect asbestos-containing materials. If the analytical results indicated that all the samples collected per homogeneous area did not contain asbestos, then the homogeneous area (material) was considered non-asbestos-containing. However, if the analytical results of one or more of the samples collected per homogeneous area indicated that asbestos was present in quantities greater than one percent asbestos (as defined by EPA), all of the homogeneous area (material) was treated as an asbestos-containing material regardless of any other analytical results. Materials which were visually determined to be non-asbestos (i.e. fibrous glass, foam rubber, etc.) by the accredited inspector were not required to be sampled. Actual collection of a bulk asbestos sample involves

physically removing approximately one square inch (1 in^2) of material and placing it in an airtight sample container. Sample containers were marked with a unique identification number, which was documented in the field notes.

3.4 Laboratory Analytical Results

A total of **189** samples were collected from building materials suspected of containing asbestos. The samples were submitted under chain of custody to EMSL Analytical, Inc. (EMSL) located at 200 Route 130 North in Cinnaminson, New Jersey, for analysis by polarized light microscopy (PLM) with dispersion staining techniques per the *USEPA Method for the Determination of Asbestos in Bulk Building Materials (600/R-93-116)*. The percentage of asbestos, if applicable, was established by microscopic visual estimation. EMSL is an accredited laboratory by the National Voluntary Laboratory Accreditation Plan (NVLAP) No. 101048-0. Any material that contains greater than one percent (>1%) asbestos is considered an ACM and must be handled according to Occupational Safety and Health Administration (OSHA), USEPA, and all applicable state and local regulations.

Laboratory test results are provided in Appendix A.

3.5 Suspect Asbestos-Containing Materials

The following table contains a list of suspect ACM sampled:

TABLE 1: SUSPECT ASBESTOS MATERIALS

Material	Location	Sample Number
Brick Mortar	Room 207	LC-1
Green Tile Grout	Room 207	LC-2
Plaster	Room 207	LC-3
Blue Tile Grout	Room 205	LC-4
Red Tile Grout	Room 215	LC-5
Dark Terrazzo	Room 220	LC-6
Fake Wood Floor Coating	Room 214	LC-7
Black Cove Base	Room 209	LC-8
Tan Mastic	Room 209	LC-9
White Cove Base	Room 205	LC-10
Cream Mastic	Room 205	LC-11
Sink Insulation	Room 215	LC-12
Clear Caulk - Sink	Room 206	LC-13
Window Glazing	Room 214	LC-14
Gray Caulk - Window	Room 214	LC-15
Ceiling Tile	Room 214	LC-16
Drywall Mud	Room 214	LC-17
Light Terrazzo (Center)	Room 203	LC-18
Vibration Damper	Room 201	LC-19
Plaster	Room 201	LC-20
Drywall Mud	Room 237	LC-21
Plaster	Room 220	LC-22

TABLE 1: SUSPECT ASBESTOS MATERIALS		
Material	**Location**	**Sample Number**
Vibration Damper	Room 229	LC-23
Plaster	Room 229	LC-24
Drywall	Room 229	LC-25
Fake Wood Vinyl Flooring	Room 230	LC-26
White Sheet Flooring	Room 232	LC-27
Cream Mastic	Room 232	LC-28
Pink Sheet Flooring	Room 229	LC-29
Cream Mastic	Room 229	LC-30
2 x 2 Ceiling Tile	Room 229	LC-31
Drywall Mud	Room 229	LC-32
White Caulk	Room 220 – Center Window	LC-33
White Window Glazing	Room 220 – Center Window	LC-34
Window Glazing	Room 220 – Center Window	LC-35
Gray Cove Base - Painted	Room 101	LC-36
Tan Mastic	Room 101	LC-37
Pink Sheet Flooring	Room 113	LC-38
Yellow Sheet Floor Mastic	Room 113	LC-39
Brown Sheet Floor	Room 112	LC-40
Cream Mastic	Room 112	LC-41
Yellow Tile Grout	Room 105	LC-42
Green Tile Grout	Room 103	LC-43
Brick Mortar	Room 103	LC-44
Plaster	Room 103	LC-45
Gray Fake Wood Floor Coating	Room 113	LC-46
Drywall Mud	Room 113	LC-47
Plaster	Room 113	LC-48
White Caulk	Room 104	LC-49
Sink Insulation	Room 112	LC-50
White Caulk	Room 112	LC-51
Vibration Damper	Room 110	LC-52
TSI Sealant – Pipe	Room 110	LC-53
2 x 2 Ceiling Tile	Room 113	LC-54
Brittle Tan Mastic	Room 141	LC-55
Yellow Tile Grout	Room 141	LC-56
Drywall Mud	Room 141	LC-57
Pink Sheet Floor	Room 130	LC-58
Pink Sheet Floor Mastic	Room 130	LC-59
Gray Fake Wood Floor Coating	Room 130	LC-60
Gray Speckled Coating	Linden D North Stairs	LC-61
Drywall Mud	Linden D North Stairs	LC-62
Black Cove Base	Linden D North Stairs	LC-63
Cove Base Mastic	Linden D North Stairs	LC-64
Gray Vinyl Fake Wood	Room 134	LC-65
2 x 2 Ceiling Tile	Room 134	LC-66
Vibration Damper	Room 133	LC-67

TABLE 1: SUSPECT ASBESTOS MATERIALS		
Material	**Location**	**Sample Number**
TSI Sealant	Room 133	LC-68
Duct Sealant	Room 133	LC-69
Plaster	Room 133	LC-70
Drywall	Room 133	LC-71
White Caulk	Room 139	LC-72
Drywall Mud	Room 139	LC-73
Drywall Tape	Room 139	LC-74
12 x 12 Pink VFT	Basement B10 – Cardio Room	LC-75
VFT Mastic	Basement B10 – Cardio Room	LC-76
Drywall Mud	Basement B10 – Cardio Room	LC-77
White Caulk	Basement B10 – Cardio Room Duct Work	LC-78
4” Gray Cove Base	Basement N. Hall B07	LC-79
Cove Base Mastic	Basement N. Hall B07	LC-80
Tan Mastic	Basement B07	LC-81
White Caulk	Basement B03	LC-82
1 x1 Yellow Ceramic Tile Grout	Basement B03	LC-83
4” White Cove Base	Basement B03	LC-84
Cove Base Mastic	Basement B03	LC-85
Drywall Mud	Basement B05	LC-86
TSI Elbow Steam Pipe	Basement B01	LC-87
Vibration Damper	Basement B10	LC-88
TSI Sealant	Basement B10	LC-89
Drywall Mud	Basement B10	LC-90
Cold Water Pipe Insulation - Run	Basement B07	LC-91
Cold Water Pipe Insulation - Run	Basement B07	LC-92
Cold Water Pipe Insulation - Run	Basement B07	LC-93
Hot Water Pipe Insulation - Run	Basement B07	LC-94
Hot Water Pipe Insulation - Run	Basement B07	LC-95
Hot Water Pipe Insulation - Run	Basement B07	LC-96
Circulating Water Pipe Insulation - Run	Basement B07	LC-97
Circulating Water Pipe Insulation - Run	Basement B07	LC-98
Circulating Water Pipe Insulation - Run	Basement B07	LC-99
TSI Steam Run	Basement B07	LC-100
TSI Steam Run	Basement B03	LC-101
TSI Steam Run	Basement B07	LC-102
9 x 9 VFT - Orange	Basement B15	LC-103
9 x 9 VFT – Dark Maroon	Basement B15	LC-104
9 x 9 VFT - Tan	Basement B15	LC-105
9 x 9 VFT – Black Mastic	Basement B15	LC-106
Plaster	Basement B15	LC-107
Drywall Mud	Basement B15	LC-108
Vibration Damper	Basement B15	LC-109
Black Mastic	Basement B16	LC-110
Tan Mastic	Basement B16	LC-111

TABLE 1: SUSPECT ASBESTOS MATERIALS		
Material	**Location**	**Sample Number**
12 x 12 Pink VFT	Basement B16	LC-112
Light Brown Fake Wood	Basement B17	LC-113
4” Gray Cove Base	Basement B17	LC-114
Cove Base Mastic	Basement B17	LC-115
4” Dark Gray Cove Base	Basement B18	LC-116
Cove Base Mastic	Basement B18	LC-117
Drywall Mud	Basement B21	LC-118
Drywall Tape	Basement B21	LC-119
Vibration Damper	Basement B21	LC-120
TSI Sealant	Basement B21	LC-121
Drywall	Basement B17	LC-122
Red Sheet Floor	Basement B24	LC-123
Black Mastic	Basement B24	LC-124
Tan Mastic	Basement B24	LC-125
12 x 12 White VFT	Basement B19	LC-126
Tan Mastic	Basement B19	LC-127
Salmon Sheet Floor	Basement B26	LC-128
Black Mastic	Basement B26	LC-129
Drywall Mud	Basement B31	LC-130
Drywall Mud	Basement B17	LC-131
4” Black Cove Base	Basement B32	LC-132
Cove Base Mastic	Basement B32	LC-133
Gray Fake Wood Floor	Basement B34	LC-134
Brown Floor Tile Grout	Basement B27	LC-135
6” White Cove Base	Basement B27	LC-136
Cove Base Mastic	Basement B27	LC-137
TSI Cold Water Run	Basement B17	LC-138
TSI Cold Water Run	Basement B17	LC-139
TSI Cold Water Run	Basement B17	LC-140
TSI Cold Water Elbow	Basement B17	LC-141
TSI Cold Water Elbow	Basement B17	LC-142
TSI Cold Water Elbow	Basement B17	LC-161
TSI Hot Water Run	Basement B17	LC-143
TSI Hot Water Run	Basement B17	LC-144
TSI Hot Water Run	Basement B17	LC-145
TSI Hot Water Elbow	Basement B17	LC-146
TSI Hot Water Elbow	Basement B17	LC-147
TSI Hot Water Elbow	Basement B17	LC-148
TSI Circulation Water Run	Basement B17	LC-149
TSI Circulation Water Run	Basement B17	LC-150
TSI Circulation Water Run	Basement B17	LC-151
TSI Circulation Water Elbow	Basement B17	LC-152
TSI Circulation Water Elbow	Basement B17	LC-153
TSI Circulation Water Elbow	Basement B17	LC-154
TSI Steam Run	Basement B17	LC-155

TABLE 1: SUSPECT ASBESTOS MATERIALS		
Material	**Location**	**Sample Number**
TSI Steam Run	Basement B26	LC-156
TSI Steam Run	Basement B35	LC-157
TSI Steam Elbow	Basement B17	LC-158
TSI Steam Elbow	Basement B26	LC-159
TSI Steam Elbow	Basement B35	LC-160
White Fake Wood Floor	Basement B30	LC-162
White Caulk	Exterior East side of A	LC-163
Window Glazing	Exterior East side of B	LC-164
Expansion Joint	Exterior NE Corner of B	LC-165
White Caulk	Exterior East Side of B	LC-166
Gray Caulk	Exterior East Side of A	LC-167
Window Glazing	Exterior West Side of D	LC-168
Brittle Light Gray Caulk	Exterior East Side of D	LC-169
Expansion Joint Gray	Exterior East Side of D	LC-170
HVAC Duct Insulation (interior of duct)	1st Floor, Room 133 Mechanical	LC-171
HVAC Duct Insulation (interior of duct)	2nd Floor, Room 229 Mechanical	LC-172
Plaster Ceiling	1st Floor, Linden D-142 Corridor	LD-200
Acoustical Texture Ceiling	1st Floor, Linden D-142 Corridor	LD-201
Plaster Ceiling	1st Floor, Linden D-132 Living	LD-203
Acoustical Texture Ceiling	1st Floor, Linden D-132 Living	LD-204
Plaster Wall	1st Floor, Linden D-132 Living	LD-205
Skim Coat Wall	1st Floor, Linden D-132 Living	LD-206
Plaster Wall	1st Floor, Linden D-Mechanical 133	LD-207
Skim Coat Wall	1st Floor, Linden D-Mechanical 133	LD-208
Acoustical Texture Ceiling	1st Floor, Linden C/D, Corridor 120	LD-210
Plaster Wall	2nd Floor, Linden C-Mechanical 201	LC-211
Skim Coat Wall	2nd Floor, Linden C-Mechanical 201	LC-212
Plaster Ceiling	1st Floor, Linden C-Corridor 107	LC-213
Acoustical Texture Ceiling	1st Floor, Linden C-Corridor 107	LC-214
Plaster Ceiling	1st Floor, Corridor 161 Connecting all Buildings	LC-215
Acoustical Texture Ceiling	1st Floor, Corridor 161 Connecting all Buildings	LC-216
Plaster Wall	Corridor 161 at Linden B Transition Door/Header	LC-217
Skim Coat Wall	Corridor 161 at Linden C to B Transition Door/Header	LC-218

The following table is a summary of the suspect asbestos-containing materials that have been determined, through laboratory analysis, to contain asbestos greater than one percent (>1%):

TABLE 2: ASBESTOS-CONTAINING MATERIALS

Sample Number	Material	Location	Approx. Quantity	Asbestos Content
LC-89, 121	TSI – Sealant (white)	Basement, Mechanical B10, B21, 110, 133, 201, 229	100 SF	3 – 5% Chrysotile
LC-103	9 x 9 VFT - Orange	Basement B15, B16	500 SF	4% Chrysotile
LC-104	9 x 9 VFT – Dark Maroon			8% Chrysotile
LC-105	9 x 9 VFT - Tan			6% Chrysotile
LC-106	9 x 9 VFT Black Mastic			6% Chrysotile
LC-110	Black Mastic			4% Chrysotile
LC-123	Red Sheet Floor	Basement B24	40 SF	2% Chrysotile
LC-124	Black Mastic			3% Chrysotile
LC-129	Black Mastic	Basement B26	400 SF	3% Chrysotile
LC-152, 153, & 154	TSI Hot Water, Cold Water and Circulating Water Elbows	Basement – Throughout	56 MF	45% Chrysotile
LC-168	Window Glazing	Exterior West Side Basement Linden D	35 Windows	2% Chrysotile
LD-201, 204, 210, LC-214, 216	Acoustical Ceiling Texture (over plaster and wire lath)	Linden Buildings C and D, **1st and 2nd Floors – Throughout** (above drop ceilings in many locations and assumed above drywall ceilings where height of room or corridor is reduced)	TBD	20 – 25% Chrysotile
LC-218	Skim Coat (associated with plaster wall)	1st Floor, Corridor 161, Transition Doorway/Wall at Linden C to B	200 SF	5% Chrysotile

SF = Square Feet, LF = Linear Feet, MF – Mechanical Fittings

4.0 LEAD PAINT CHIP TESTING

Atlas collected paint chip samples from representative surface coatings that may be impacted by renovation activities.

Surface coatings that were collected were considered to be representative of materials in a homogeneous area if:

1. They exhibited similar physical characteristics (suspect materials alike in appearance, substrate, color, and time of application were tested as homogenous areas)
2. The application of the tested surface could be associated to an application of an unsampled surface.

Atlas collected and submitted a total of **20** paint chip samples from surface coatings. The samples were submitted to EMSL of Cinnaminson, New Jersey, under proper chain of custody for analysis by Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B). EMSL is accredited under the American Industrial Hygiene Association-Laboratory Accreditation Program (AIHA-LAP, LLC) (AIHA-LAP; lab code 100194). A copy of the analytical results and chain of custody can be found in Appendix B.

The USEPA has defined LBP as *"paint or other surface coatings that contain lead in excess of 0.5 percent by weight (>0.5%)".* Results less than 0.5% by weight indicate that lead is not present at or above the USEPA regulatory level; however, lead was present in lower concentrations above the laboratory detection limit in other surfaces tested and these are classified as lead-containing paint (LCP). Negative results do not mean that lead is not present.

4.1 Inspection

The disturbance and disposal of materials with surface coatings that contain lead paint are regulated by the USEPA, OSHA and the State of Iowa. The Resource Conservation and Recovery Act (RCRA) provides the USEPA with the authority to regulate the waste status of demolition or renovation debris, including lead-containing materials. Specific notification and testing requirements must be addressed prior to transporting, treating, storing, or disposing of hazardous wastes.
Construction work covered by 29 CFR 1926.62 includes any repair, renovation or other activities that disturb in-place, lead-containing materials, but does not include routine cleaning and repainting where there is insignificant damage, wear or corrosion of existing lead-containing coatings or substrates. Unless adequately protected, employee exposures to lead must not exceed airborne concentrations >50 micrograms per cubic meter ($\mu g/m^3$) averaged over an 8-hour period.

Occupational exposure to lead occurring in the course of construction work, including maintenance activities, painting, alteration and repairs is subject to the OSHA Lead standard (29 CFR 1926.62). The lead standard applies to any detectable concentration of lead in paint, as even small concentrations of lead can result in unacceptable employee exposures depending upon the method of removal and other workplace conditions.

The disposal of lead-based paint waste, as well as paint waste containing other heavy metals, is regulated by the USEPA and State of Iowa. Wastes generated by industrial businesses, commercial businesses, and government institutions are subject to regulation. Commercial business owners and removal contractors are required to determine if paint waste generated from nonresidential structures (such as public and commercial buildings, warehouses, bridges, water towers, and transmission towers) contains heavy metals that would cause the debris to be considered a hazardous waste. Disposal options and applicable management requirements for collected debris will be based upon whether the waste stream is considered a hazardous waste and the amount of debris generated. Removal contractors and building owners need to include these factors when preparing and responding to bid specifications. Specific notification and testing requirements must be addressed prior to transporting, treating, storing, or disposing of hazardous wastes. Lead-containing wastes are considered hazardous waste under RCRA if Toxicity Characteristic Leachate Procedure (TCLP) results exceed 5 milligrams per liter (mg/L). The USEPA has made exceptions for the handling and disposal of lead wastes generated from residential housing.

Specific notification and testing requirements must be addressed prior to transporting, treating, storing, or disposing of hazardous wastes. Lead-containing wastes are considered hazardous waste under RCRA if Toxicity Characteristic Leachate Procedure (TCLP) results exceed 5 milligrams per liter (mg/L). The USEPA has made exceptions for the handling and disposal of lead wastes generated from residential housing.

The above overview is not intended to be inclusive of all potentially pertinent regulatory information. The relevant USEPA, OSHA and State of Iowa regulations should be consulted prior to undertaking activities involving the demolition, renovation or maintenance of surface coatings that contain lead.

4.2 Lead Paint Testing

The following surface coatings were collected as part of the lead paint testing:

TABLE 3: LEAD PAINT SUMMARY

Sample Number	Sample Location	Representative Material	Paint Color	Lead Concentration (% by weight)
PCLC-1	Room 202	Plaster	Green	0.075%
PCLC-2	Room 202	Brick	Orange	<0.008
PCLC-3	Room 202	Brick	Light Blue	<0.008
PCLC-4	Room 215	Metal	Dark Gray-Blue	<0.008
PCLC-5	Room 214	Metal	Dark Blue	<0.008
PCLC-6	Room 214	Gray	Brick	<0.008
PCLC-7	Room 206	White	CMU	<0.008
PCLC-8	Room 206	Tan	CMU	<0.008
PCLC-9	Room 227	Light Green	Plaster	<0.008

TABLE 3: LEAD PAINT SUMMARY				
Sample Number	Sample Location	Representative Material	Paint Color	Lead Concentration (% by weight)
PCLC-10	Room 229	Dark Gray	Brick	<0.008
PCLC-11	Room 135	Black	Brick	<0.008
PCLC-12	Room 135	Purple	Brick	<0.008
PCLC-13	Basement B07	Gray-Blue	Plaster/Concrete	<0.008
PCLC-14	Basement B07	Concrete	Off white	0.013%
PCLC-15	Basement B07	Concrete	White	<0.008
PCLC-16	Basement B07 Handrail	Metal	Blue	<0.008
PCLC-17	Basement B01 Handrail	Metal	Black	<0.008
PCLC-18	Basement B01 Wall	Concrete	Light Blue	<0.008
PCLC-19	Basement B17 Wall	Drywall	Beige	0.020%
PCLC-20	North Stairwell D	Concrete	Speckled Blue	<0.008

bolded = lead-based paint

This evaluation report can help the Owner develop a plan for renovating the building by having concentrations of lead in the paint identified. It is our understanding that the information in this report will be provided to the contractors so that appropriate precautions can be made to minimize worker exposure to lead. If surface coatings with lead containing paint are handled improperly, exposure could occur to workers and future occupants of the facility.

5.0 HAZARDOUS MATERIALS ASSESSMENT

Atlas completed a visual inspection of rooms / areas throughout the intended work areas in an attempt to identify hazardous wastes or universal wastes that may be impacted by planned renovation activities. The survey included a visual inspection of: light fixtures and other equipment for the presence of Polychlorinated Biphenyls (PCBs); light bulbs, thermostats, switches, and other equipment for the presence of mercury; refrigerants, batteries, and devices with potential radioactive materials.

TABLE4: HAZARDOUS BUILDING MATERIALS		
Category	Material	Estimated Quantity
Batteries	Lead Acid	NA
	Nickel Cadmium	23 (exit signs)
	Lithium-Ion	NA
Mercury	Thermostats	NA

TABLE 4: HAZARDOUS BUILDING MATERIALS		
Category	**Material**	**Estimated Quantity**
	Fluorescent Light Tubes	854
	High Intensity Discharge Bulbs	NA
	Strobes	NA
Poly-Chlorinated Biphenyl (PCBs)	Light Ballasts	2
	Transformers	2
Low Level Radioactive Sources (LLR)	Tritium Exit Signs	NA
	Smoke Detectors	157
Chlorofluorocarbons (CFCs) or Hydro Chlorofluorocarbons (HCFCs)	Refrigerator/Cooler	NA
	Freezer	NA
	Water Fountain	NA

Hazardous materials or universal wastes identified in Table 4 that will be impacted by renovation activities shall be removed as part of the renovation contractor's scope of work and disposed of according to USEPA Toxic Substances Control Act (TSCA) and the State of Iowa regulations.

6.0 CONCLUSIONS

6.1 Asbestos

The NESHAP and OSHA regulations govern the removal of ACM. Atlas recommends that a State of Iowa certified abatement contractor be retained to properly abate and dispose of ACM identified in Table 1 above and in accordance with local, state, and federal regulations.

The owner and/or operator are responsible for NESHAP regulatory compliance regarding the proper removal, handling, and disposal of ACM containing >1% asbestos prior to renovation or demolition. Also, per state regulations, please be aware that the owner and/or operator must submit a notification to the Iowa Department of Natural Resources (IDNR) 10 business days prior to asbestos abatement at certain quantity thresholds and prior to renovation/demolition activities.

6.2 Lead

Lead was identified above the laboratory detection limit in three of the 20 surface coatings tested.

Contractors should use caution during construction-related activities as concealed surface coatings containing lead-based paints that were not previously tested may be encountered. If materials not sampled during this investigation are later identified to contain regulated quantities of lead concentrations, then they should be removed, controlled and/or disposed of in accordance with federal, state and local regulations, prior to disturbance. OSHA considers any detectable

level of lead as LCP and disturbance of these surface coatings is subject to the training and work practices in OSHA 29 CFR 1926.62 “Lead in Construction”.

6.3 Hazardous Building Materials

Hazardous materials or universal wastes identified in Table 4 that will be impacted by renovation activities shall be removed as part of the renovation contractor’s scope of work and disposed of according to USEPA Toxic Substances Control Act (TSCA) and the State of Iowa regulations.

7.0 ASSUMPTIONS AND LIMITATIONS

The results, findings, conclusions, and recommendations expressed in this report are based solely on conditions noted during the October 2, 4, September 27, November 20, 2024 and December 12 and 22, 2025, Atlas HBM survey of Linden Court Buildings C & D located on the Woodward Resource Center Campus in Woodward, Iowa.

Atlas did not perform destructive sampling -- it was not within Atlas’s scope of work to remove surface materials to investigate portions of the structure or materials that may lay beneath the surface -- thus, any materials that could not be visually identified on the surface were not inspected and would not be noted in this report. Atlas’s selection of sample locations and frequency of sampling was based on the inspector’s assumption that like materials in the same area are homogeneous in content.

The report is designed to aid the building owner, architect, construction manager, general contractor, and potential abatement contractor in locating hazardous building materials. Under no circumstances is the report to be utilized as a bidding document or as a project specification document since it does not have all the components required to serve as a Project Design document or an Abatement Work plan.

Our professional services have been performed, our findings obtained, and our conclusions and recommendations prepared in accordance with customary principles and practices in the fields of environmental science and engineering. This statement is in lieu of other statements either expressed or implied. This report does not warrant against future operations or conditions, nor does it warrant against operations or conditions present of a type or at a location not investigated.

This report is intended for the sole use of IDAS. The scope of services performed in execution of this evaluation may not be appropriate to satisfy the needs of other users, and use or re-use of this document or the findings, conclusions, or recommendations is at the risk of said user.

Atlas recommendations are based in part on federal, state, local regulations, and guidelines. Atlas does not undertake responsibility for reporting to any local, state, or federal public agencies of conditions at the site that may present a potential danger to public health or safety. Atlas recommends that the Client comply with regulations and response actions in accordance with federal, state, and local regulations.

APPENDIX A

ASBESTOS ANALYTICAL RESULTS AND CHAIN OF CUSTODY

EMSL Analytical, Inc.

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Project ID:	

Attention:	Eric Brown	**Phone:**	(402) 697-9747
	Atlas Technical	**Fax:**	(402) 597-8532
	11117 Mockingbird Drive	**Received Date:**	10/07/2024 9:00 AM
	Omaha, NE 68137	**Analysis Date:**	10/09/2024 - 10/10/2024
		Collected Date:	10/02/2024

Project: 204BS07475 / Woodward Tunnel Survey / Linden C & D

Test Report: Asbestos Analysis of Bulk Materials via AHERA Method 40CFR 763 Subpart E Appendix E supplemented with EPA 600/R-93/116 using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
LC-1 *042420812-0001*	Floor 2 - 207 - Brick Mortar	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-2 *042420812-0002*	Floor 2 - 207 - Green Tile Grout	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-3-Plaster *042420812-0003*	Floor 2 - 207 - Plaster	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-3-Skim Coat *042420812-0003A* *Inseparable paint / coating layer included in analysis*	Floor 2 - 207 - Plaster	White/Red Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-4 *042420812-0004*	Floor 2 - 205 - Blue Tile Grout	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-5 *042420812-0005*	Floor 2 - 215 - Red Tile Grout	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-6 *042420812-0006*	Floor 2 - 220 - Dark Terrazzo	Tan/Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-7 *042420812-0007*	Floor 2 - 214 - Faux Wood Floor Coating	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-8 *042420812-0008*	Floor 2 - 209 - Black Cove Base	Gray/Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-9 *042420812-0009*	Floor 2 - 209 - Tan Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-10 *042420812-0010*	Floor 2 - 205 - White Cove Base	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-11 *042420812-0011*	Floor 2 - 205 - Cream Mastic	Tan/Beige Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-12 *042420812-0012*	Floor 2 - 215 - Sink Insulation	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-13 *042420812-0013*	Floor 2 - 206 - Clear Sink Caulk	Clear Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-14 *042420812-0014*	Floor 2 - 214 - Window Glazing	Gray/Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-15 *042420812-0015*	Floor 2 - 214 - Gray Window Caulk	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

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Test Report: Asbestos Analysis of Bulk Materials via AHERA Method 40CFR 763 Subpart E Appendix E supplemented with EPA 600/R-93/116 using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
LC-16 *042420812-0016*	Floor 2 - 214 - Ceiling Tile	Tan/White Fibrous Homogeneous	40% Cellulose 40% Min. Wool	5% Perlite 15% Non-fibrous (Other)	None Detected
LC-17 *042420812-0017*	Floor 2 - 214 - Drywall Mud	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-18 *042420812-0018*	Floor 2 - 203 - Light Terrazzo - Center	Gray/Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-19 *042420812-0019*	Floor 2 - 201 - Vibration Damper	Brown/Black Fibrous Homogeneous	95% Cellulose	5% Non-fibrous (Other)	None Detected
LC-20-Plaster *042420812-0020*	Floor 2 - 201 - Plaster	Tan/White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-20-Skim Coat *042420812-0020A*	Floor 2 - 201 - Plaster	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-21 *042420812-0021*	Floor 2 - 237 - Drywall Mud	Brown/White/Orange Non-Fibrous Heterogeneous		100% Non-fibrous (Other)	None Detected
Result includes a small amount of inseparable attached material					
LC-22-Plaster *042420812-0022*	Floor 2 - 220 - Plaster	Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-22-Skim Coat *042420812-0022A*	Floor 2 - 220 - Plaster	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-23 *042420812-0023*	Floor 2 - 229 - Vibration Damper	Brown/White Fibrous Homogeneous	95% Cellulose	5% Non-fibrous (Other)	None Detected
LC-24-Plaster *042420812-0024*	Floor 2 - 229 - Plaster	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-24-Skim Coat *042420812-0024A*	Floor 2 - 229 - Plaster	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-25 *042420812-0025*	Floor 2 - 229 - Drywall	Brown/White Fibrous Homogeneous	15% Cellulose 5% Glass	80% Non-fibrous (Other)	None Detected
LC-26 *042420812-0026*	Floor 2 - 230 - Faux Wood Vinyl Flooring	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-27 *042420812-0027*	Floor 2 - 232 - White Sheet Flooring	Tan/White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-28 *042420812-0028*	Floor 2 - 232 - Cream Mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-29 *042420812-0029*	Floor 2 - 229 - Pink Sheet Flooring	Pink Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-30 *042420812-0030*	Floor 2 - 229 - Cream Mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

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Test Report: Asbestos Analysis of Bulk Materials via AHERA Method 40CFR 763 Subpart E Appendix E supplemented with EPA 600/R-93/116 using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
LC-31 *042420812-0031*	Floor 2 - 229 - 2x2 Ceiling Tile	Tan/White Fibrous Homogeneous	60% Cellulose 20% Min. Wool	5% Perlite 15% Non-fibrous (Other)	None Detected
LC-32 *042420812-0032*	Floor 2 - 229 - Drywall Mud	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-33 *042420812-0033*	Floor 2 - 220 - White Caulk	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-34 *042420812-0034*	Floor 2 - 220 - White Window Glazing	Tan/White Non-Fibrous Homogeneous	5% Fibrous (Other)	95% Non-fibrous (Other)	None Detected
LC-35 *042420812-0035*	Floor 2 - 220 - Older Window Glazing	Tan/White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-36 *042420812-0036*	Floor 1 - 101 - Gray Cove Base	Gray/Green Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-37 *042420812-0037*	Floor 1 - 101 - Tan Cove Base Mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-38 *042420812-0038*	Floor 1 - 113 - Pink Sheet Floor	Pink Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-39 *042420812-0039*	Floor 1 - 113 - Yellow Sheet Floor Mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-40 *042420812-0040*	Floor 1 - 112 - Brown Sheet Floor	Brown Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-41 *042420812-0041*	Floor 1 - 112 - Cream Mastic	Tan Non-Fibrous Homogeneous	10% Fibrous (Other)	90% Non-fibrous (Other)	None Detected
LC-42 *042420812-0042*	Floor 1 - 105 - Yellow Tile Grout	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-43 *042420812-0043*	Floor 1 - 103 - Green Tile Grout	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-44 *042420812-0044*	Floor 1 - 103 - Brick Mortar	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-45-Plaster *042420812-0045*	Floor 1 - 103 - Plaster	Gray/White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-45-Texture *042420812-0045A*	Floor 1 - 103 - Plaster	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-46 *042420812-0046*	Floor 1 - 113 - Gray Faux Wood Coating	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-47 *042420812-0047*	Floor 1 - 113 - Drywall Mud	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-48 *042420812-0048*	Floor 1 - 113 - Plaster	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

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			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
LC-49 *042420812-0049*	Floor 1 - 104 - White Caulk	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-50 *042420812-0050*	Floor 1 - 112 - Sink Insulation	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-51 *042420812-0051*	Floor 1 - 112 - White Caulk	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-52 *042420812-0052*	Floor 1 - 110 - Vibrartion Damper	Black Fibrous Homogeneous	95% Cellulose	5% Non-fibrous (Other)	None Detected
LC-53 *042420812-0053*	Floor 1 - 110 - TSI Pipe Sealant	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-54 *042420812-0054*	Floor 1 - 113 - 2x2 Ceiling Tile	White Fibrous Homogeneous	50% Cellulose 30% Min. Wool	20% Non-fibrous (Other)	None Detected
LC-55 *042420812-0055*	Floor 1 - 141 - Tan Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-56 *042420812-0056*	Floor 1 - 141 - Yellow Tile Grout	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-57 *042420812-0057*	Floor 1 - 141 - Drywall Mud	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-58 *042420812-0058*	Floor 1 - 130 - Pink Sheet Floor	Pink Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-59 *042420812-0059*	Floor 1 - 130 - Pink Sheet Floor Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-60 *042420812-0060*	Floor 1 - 130 - Gray Faux Wood Floor Coating	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-61 *042420812-0061*	Floor 1 - D North Stairwell - Gray Speckled Coating	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-62 *042420812-0062*	Floor 1 - D North Stairwell - Drywall Mud	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-63 *042420812-0063*	Floor 1 - D North Stairwell - Black Cove Base	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-64-Mastic *042420812-0064*	Floor 1 - D North Stairwell - Tan Cove Base Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-64-Joint Compound *042420812-0064A*	Floor 1 - D North Stairwell - Tan Cove Base Mastic	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-65 *042420812-0065*	Floor 1 - 134 - Gray Faux Wood Vinyl	Black Fibrous Homogeneous	5% Glass	95% Non-fibrous (Other)	None Detected
LC-66 *042420812-0066*	Floor 1 - 134 - 2x2 Ceiling Tile	Gray Fibrous Homogeneous	40% Cellulose 40% Min. Wool	20% Non-fibrous (Other)	None Detected

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			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
LC-67 *042420812-0067*	Floor 1 - 133 - Vibration Damper	Black Fibrous Homogeneous	95% Cellulose	5% Non-fibrous (Other)	None Detected
LC-68 *042420812-0068*	Floor 1 - 133 - TSI Sealant	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-69 *042420812-0069*	Floor 1 - 133 - Duct Sealant	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-70 *042420812-0070*	Floor 1 - 133 - Plaster	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-71 *042420812-0071*	Floor 1 - 133 - Drywall	White Fibrous Homogeneous	20% Cellulose	80% Non-fibrous (Other)	None Detected
LC-72 *042420812-0072*	Floor 1 - 139 - White Caulk	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-73 *042420812-0073*	Floor 1 - 139 - Drywall Mud	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-74 *042420812-0074*	Basement - B10 Cardio Room - Drywall Tape	White Fibrous Homogeneous	95% Cellulose	5% Non-fibrous (Other)	None Detected
LC-75 *042420812-0075*	Basement - B10 Cardio Room - 12"x12" Pink VFT	Pink Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-76 *042420812-0076*	Basement - B10 Dividing Wall - VFT Mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-77 *042420812-0077*	Basement - B10 Cardio Room on Duct Work - Drywall Mud	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-78 *042420812-0078*	Basement - B07 N Hall - White Caulk	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-79 *042420812-0079*	Basement - B07 N Hall - 4" Gray Cove Base	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-80 *042420812-0080*	Basement - B07 N Hall - Cove Base Mastic	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-81 *042420812-0081*	Basement - B03 Restroom - Tan Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-82 *042420812-0082*	Basement - B03 Restroom - White Caulk	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-83 *042420812-0083*	Basement - B03 Restroom - Gray 1"x1" Yellow Ceramic Tile Grout	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-84 *042420812-0084*	Basement - B03 Restroom - 4" White Cove Base	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-85 *042420812-0085*	Basement - B03 Restroom - Cove Base Mastic	Clear Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

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			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
LC-86 *042420812-0086*	Basement - B05 Restroom - Drywall Mud	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-87 *042420812-0087*	Basement - B01 Nurses Office - TSI Elbow Steam	Gray Fibrous Homogeneous	55% Min. Wool	45% Non-fibrous (Other)	None Detected
LC-88 *042420812-0088*	Basement - B10 - Vibration Damper	Black Fibrous Homogeneous	80% Cellulose	20% Non-fibrous (Other)	None Detected
LC-89-Sealant *042420812-0089*	Basement - B10 - TSI Sealant	White Non-Fibrous Homogeneous		95% Non-fibrous (Other)	**5% Chrysotile**
LC-89-Insulation *042420812-0089A*	Basement - B10 - TSI Sealant	Yellow Fibrous Homogeneous	95% Glass	5% Non-fibrous (Other)	None Detected
LC-90 *042420812-0090*	Basement - B10 - Drywall Mud	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-91-Insulation *042420812-0091*	Basement - B07 - Cold Water Run	Yellow Fibrous Homogeneous	95% Glass	5% Non-fibrous (Other)	None Detected
LC-91-Sealant *042420812-0091A*	Basement - B07 - Cold Water Run	White Fibrous Homogeneous	40% Cellulose	60% Non-fibrous (Other)	None Detected
LC-92-Insulation *042420812-0092*	Basement - B07 - Cold Water Run	Yellow Fibrous Homogeneous	95% Glass	5% Non-fibrous (Other)	None Detected
LC-92-Sealant *042420812-0092A*	Basement - B07 - Cold Water Run	White Fibrous Homogeneous	40% Cellulose	60% Non-fibrous (Other)	None Detected
LC-93-Insulation *042420812-0093*	Basement - B07 - Cold Water Run	Yellow Fibrous Homogeneous	95% Glass	5% Non-fibrous (Other)	None Detected
LC-93-Sealant *042420812-0093A*	Basement - B07 - Cold Water Run	White Fibrous Homogeneous	35% Cellulose	65% Non-fibrous (Other)	None Detected
LC-94-Insulation *042420812-0094*	Basement - B07 - Hot Water Run	Yellow Fibrous Homogeneous	95% Glass	5% Non-fibrous (Other)	None Detected
LC-94-Sealant *042420812-0094A*	Basement - B07 - Hot Water Run	White Fibrous Homogeneous	40% Cellulose	60% Non-fibrous (Other)	None Detected
LC-95-Insulation *042420812-0095*	Basement - B07 - Hot Water Run	Yellow Fibrous Homogeneous	95% Glass	5% Non-fibrous (Other)	None Detected
LC-95-Sealant *042420812-0095A*	Basement - B07 - Hot Water Run	White Fibrous Homogeneous	40% Cellulose	60% Non-fibrous (Other)	None Detected
LC-96-Insulation *042420812-0096*	Basement - B07 - Hot Water Run	Yellow Fibrous Homogeneous	95% Glass	5% Non-fibrous (Other)	None Detected
LC-96-Sealant *042420812-0096A*	Basement - B07 - Hot Water Run	White Fibrous Homogeneous	35% Cellulose	65% Non-fibrous (Other)	None Detected
LC-97-Insulation *042420812-0097*	Basement - B07 - Circulating Run	Yellow Fibrous Homogeneous	95% Glass	5% Non-fibrous (Other)	None Detected

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			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
LC-97-Sealant *042420812-0097A*	Basement - B07 - Circulating Run	White Fibrous Homogeneous	40% Cellulose	60% Non-fibrous (Other)	None Detected
LC-98-Insulation *042420812-0098*	Basement - B07 - Circulating Run	Yellow Fibrous Homogeneous	95% Glass	5% Non-fibrous (Other)	None Detected
LC-98-Sealant *042420812-0098A*	Basement - B07 - Circulating Run	White Fibrous Homogeneous	40% Cellulose	60% Non-fibrous (Other)	None Detected
LC-99-Insulation *042420812-0099*	Basement - B07 - Circulating Run	Yellow Fibrous Homogeneous	95% Glass	5% Non-fibrous (Other)	None Detected
LC-99-Sealant *042420812-0099A*	Basement - B07 - Circulating Run	White Fibrous Homogeneous	35% Cellulose	65% Non-fibrous (Other)	None Detected
LC-100-Insulation *042420812-0100*	Basement - B07 - Steam Run	Yellow Fibrous Homogeneous	95% Glass	5% Non-fibrous (Other)	None Detected
LC-100-Sealant *042420812-0100A*	Basement - B07 - Steam Run	White Fibrous Homogeneous	40% Cellulose	60% Non-fibrous (Other)	None Detected
LC-101-Insulation *042420812-0101*	Basement - B03 - Steam Run	Yellow Fibrous Homogeneous	95% Glass	5% Non-fibrous (Other)	None Detected
LC-101-Sealant *042420812-0101A*	Basement - B03 - Steam Run	White Fibrous Homogeneous	40% Cellulose	60% Non-fibrous (Other)	None Detected
LC-102-Insulation *042420812-0102*	Basement - B07 - Steam Run	Yellow Fibrous Homogeneous	95% Glass	5% Non-fibrous (Other)	None Detected
LC-102-Sealant *042420812-0102A*	Basement - B07 - Steam Run	White Fibrous Homogeneous	35% Cellulose	65% Non-fibrous (Other)	None Detected
LC-103 *042420812-0103*	Basement - B15 - 9x9 Orange VFT	Orange Non-Fibrous Homogeneous		96% Non-fibrous (Other)	**4% Chrysotile**
LC-104 *042420812-0104*	Basement - B15 - 9x9 Dk Maroon VFT	Red Non-Fibrous Homogeneous		92% Non-fibrous (Other)	**8% Chrysotile**
LC-105 *042420812-0105*	Basement - B15 - 9x9 Tan VFT	Tan Non-Fibrous Homogeneous		94% Non-fibrous (Other)	**6% Chrysotile**
LC-106 *042420812-0106*	Basement - B15 - 9x9 Blacn VFT Mastic	Black Non-Fibrous Homogeneous		94% Non-fibrous (Other)	**6% Chrysotile**
LC-107 *042420812-0107*	Basement - B15 - Plaster	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-108 *042420812-0108*	Basement - B15 - Drywall Mud	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-109 *042420812-0109*	Basement - B15 - Vibration Damper	Black Fibrous Homogeneous	80% Cellulose	20% Non-fibrous (Other)	None Detected
LC-110 *042420812-0110*	Basement - B16 - Black Mastic	Black Fibrous Homogeneous		96% Non-fibrous (Other)	**4% Chrysotile**

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EMSL Order: 042420812
Customer ID: ATC55
Customer PO:
Project ID:

Test Report: Asbestos Analysis of Bulk Materials via AHERA Method 40CFR 763 Subpart E Appendix E supplemented with EPA 600/R-93/116 using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
LC-111 *042420812-0111*	Basement - B16 - Tan Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-112 *042420812-0112*	Basement - B16 - 1212 Pink VFT	Pink Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-113 *042420812-0113*	Basement - B17 - Lt Brown Faux Wood	Brown Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-114 *042420812-0114*	Basement - B17 - 4" Gray Cove Base	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-115 *042420812-0115*	Basement - B17 - Cove Base Mastic	Gray/Tan/Yellow Non-Fibrous Heterogeneous		100% Non-fibrous (Other)	None Detected
Result includes a small amount of inseparable attached material					
LC-116 *042420812-0116*	Basement - B18 - 4" Dark Gray Cove Base	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-117 *042420812-0117*	Basement - B18 - Cove Base Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-118 *042420812-0118*	Basement - B21 - Drywall Mud	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-119 *042420812-0119*	Basement - B21 - Drywall Tape	White Fibrous Homogeneous	95% Cellulose	5% Non-fibrous (Other)	None Detected
LC-120 *042420812-0120*	Basement - B21 - Vibration Damper	Gray/Black Fibrous Homogeneous	85% Cellulose	15% Non-fibrous (Other)	None Detected
LC-121 *042420812-0121*	Basement - B21 - TSI Sealant	White Fibrous Homogeneous		97% Non-fibrous (Other)	**3% Chrysotile**
LC-122 *042420812-0122*	Basement - B17 - Drywall	Brown/White Fibrous Homogeneous	15% Cellulose 2% Glass	83% Non-fibrous (Other)	None Detected
LC-123 *042420812-0123*	Basement - B24 - Red Sheet Floor	Red Fibrous Homogeneous		98% Non-fibrous (Other)	**2% Chrysotile**
LC-124 *042420812-0124*	Basement - B24 - Black Mastic	Black Fibrous Homogeneous		97% Non-fibrous (Other)	**3% Chrysotile**
LC-125 *042420812-0125*	Basement - B24 - Tan Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-126 *042420812-0126*	Basement - B19 - 12x12 White VFT	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-127 *042420812-0127*	Basement - B19 - Tan Mastic	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-128 *042420812-0128*	Basement - B26 - Salmon Sheet Floor	Brown Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

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			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
LC-129 *042420812-0129*	Basement - B26 - Black Mastic	Black Fibrous Homogeneous		97% Non-fibrous (Other)	**3% Chrysotile**
LC-130 *042420812-0130*	Basement - B31 - Drywall Mud	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-131 *042420812-0131* *Result includes a small amount of inseparable attached material*	Basement - B17 - Drywall Mud	Brown/White Non-Fibrous Heterogeneous		100% Non-fibrous (Other)	None Detected
LC-132 *042420812-0132*	Basement - B32 - 4" Black Cove Base	Black Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-133 *042420812-0133*	Basement - B32 - Cove Base Mastic	Brown Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-134 *042420812-0134*	Basement - B34 - Gray Faux Wood	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-135 *042420812-0135*	Basement - B27 - Brown Floor Tile Grout	Brown Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-136 *042420812-0136*	Basement - B27 - 6" White Cove Base	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-137 *042420812-0137*	Basement - B27 - Cove Base Mastic	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-138-Run Insulation *042420812-0138*	Basement - B17 - Cold Water Run	Yellow Fibrous Homogeneous	95% Glass	5% Non-fibrous (Other)	None Detected
LC-138-Backing *042420812-0138A*	Basement - B17 - Cold Water Run	White Fibrous Homogeneous	55% Cellulose	45% Non-fibrous (Other)	None Detected
LC-139-Run Insulation *042420812-0139*	Basement - B17 - Cold Water Run	Yellow Fibrous Homogeneous	95% Glass	5% Non-fibrous (Other)	None Detected
LC-139-Backing *042420812-0139A*	Basement - B17 - Cold Water Run	White Fibrous Homogeneous	55% Cellulose	45% Non-fibrous (Other)	None Detected
LC-140-Run Insulation *042420812-0140*	Basement - B17 - Cold Water Run	Yellow Fibrous Homogeneous	95% Glass	5% Non-fibrous (Other)	None Detected
LC-140-Backing *042420812-0140A*	Basement - B17 - Cold Water Run	White Fibrous Homogeneous	60% Cellulose	40% Non-fibrous (Other)	None Detected
LC-161-Elbow Insulation *042420812-0141*	Basement - B17 - Cold Water Elbow	Gray Fibrous Homogeneous	55% Min. Wool	45% Non-fibrous (Other)	None Detected
LC-161-Backing *042420812-0141A*	Basement - B17 - Cold Water Elbow	Black Fibrous Homogeneous	35% Cellulose	65% Non-fibrous (Other)	None Detected
LC-141-Elbow Insulation *042420812-0142*	Basement - B17 - Cold Water Elbow	Gray Fibrous Homogeneous	55% Min. Wool	45% Non-fibrous (Other)	None Detected
LC-141-Backing *042420812-0142A*	Basement - B17 - Cold Water Elbow	White Fibrous Homogeneous	35% Cellulose	65% Non-fibrous (Other)	None Detected

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			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
LC-142-Elbow Insulation *042420812-0143*	Basement - B17 - Cold Water Elbow	Gray Fibrous Homogeneous	60% Min. Wool	40% Non-fibrous (Other)	None Detected
LC-142-Backing *042420812-0143A*	Basement - B17 - Cold Water Elbow	White Fibrous Homogeneous	60% Cellulose	40% Non-fibrous (Other)	None Detected
LC-143-Run Insulation *042420812-0144*	Basement - B17 - Hot Water Run	Yellow Fibrous Homogeneous	95% Glass	5% Non-fibrous (Other)	None Detected
LC-143-Backing *042420812-0144A*	Basement - B17 - Hot Water Run	White Fibrous Homogeneous	35% Cellulose	65% Non-fibrous (Other)	None Detected
LC-144-Run Insulation *042420812-0145*	Basement - B17 - Hot Water Run	Yellow Fibrous Homogeneous	95% Glass	5% Non-fibrous (Other)	None Detected
LC-144-Backing *042420812-0145A*	Basement - B17 - Hot Water Run	White Fibrous Homogeneous	35% Cellulose	65% Non-fibrous (Other)	None Detected
LC-145-Run Insulation *042420812-0146*	Basement - B17 - Hot Water Run	Yellow Fibrous Homogeneous	95% Glass	5% Non-fibrous (Other)	None Detected
LC-145-Backing *042420812-0146A*	Basement - B17 - Hot Water Run	White Fibrous Homogeneous	40% Cellulose	60% Non-fibrous (Other)	None Detected
LC-146-Elbow Insulation *042420812-0147*	Basement - B17 - How Water Elbow	Gray Fibrous Homogeneous	55% Min. Wool	45% Non-fibrous (Other)	None Detected
LC-146-Backing *042420812-0147A*	Basement - B17 - How Water Elbow	White Fibrous Homogeneous	35% Cellulose	65% Non-fibrous (Other)	None Detected
LC-147-Elbow Insulation *042420812-0148*	Basement - B17 - How Water Elbow	Gray Fibrous Homogeneous	55% Min. Wool	45% Non-fibrous (Other)	None Detected
LC-147-Backing *042420812-0148A*	Basement - B17 - How Water Elbow	White Fibrous Homogeneous	35% Cellulose	65% Non-fibrous (Other)	None Detected
LC-148-Elbow Insulation *042420812-0149*	Basement - B17 - How Water Elbow	Gray Fibrous Homogeneous	60% Min. Wool	40% Non-fibrous (Other)	None Detected
LC-148-Backing *042420812-0149A*	Basement - B17 - How Water Elbow	White Fibrous Homogeneous	35% Cellulose	65% Non-fibrous (Other)	None Detected
LC-149-Run Insulation *042420812-0150*	Basement - B17 - Circulating Run	Yellow Fibrous Homogeneous	95% Glass	5% Non-fibrous (Other)	None Detected
LC-149-Backing *042420812-0150A*	Basement - B17 - Circulating Run	White Fibrous Homogeneous	35% Cellulose	65% Non-fibrous (Other)	None Detected
LC-150-Run Insulation *042420812-0151*	Basement - B17 - Circulating Run	Yellow Fibrous Homogeneous	95% Glass	5% Non-fibrous (Other)	None Detected
LC-150-Backing *042420812-0151A*	Basement - B17 - Circulating Run	White Fibrous Homogeneous	34% Cellulose	66% Non-fibrous (Other)	None Detected
LC-151-Run Insulation *042420812-0152*	Basement - B17 - Circulating Run	Yellow Fibrous Homogeneous	95% Glass	5% Non-fibrous (Other)	None Detected

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			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
LC-151-Backing *042420812-0152A*	Basement - B17 - Circulating Run	White Fibrous Homogeneous	40% Cellulose	60% Non-fibrous (Other)	None Detected
LC-152 *042420812-0153*	Basement - B17 - Circulating Elbow	Gray/White Fibrous Homogeneous	5% Cellulose	50% Non-fibrous (Other)	**45% Chrysotile**
LC-153 *042420812-0154*	Basement - B17 - Circulating Elbow	Gray/Tan/White Fibrous Homogeneous	5% Cellulose	50% Non-fibrous (Other)	**45% Chrysotile**
LC-154 *042420812-0155*	Basement - B17 - Circulating Elbow	Gray/White Fibrous Homogeneous	5% Cellulose	50% Non-fibrous (Other)	**45% Chrysotile**
LC-155-Run Insulation *042420812-0156*	Basement - B17 - Steam Run	Yellow Fibrous Homogeneous	95% Glass	5% Non-fibrous (Other)	None Detected
LC-155-Backing *042420812-0156A*	Basement - B17 - Steam Run	Tan/White Fibrous Homogeneous	35% Cellulose	65% Non-fibrous (Other)	None Detected
LC-156-Run Insulation *042420812-0157*	Basement - B26 - Steam Run	Yellow Fibrous Homogeneous	95% Glass	5% Non-fibrous (Other)	None Detected
LC-156-Backing *042420812-0157A*	Basement - B26 - Steam Run	White/Silver Fibrous Homogeneous	40% Cellulose 20% Glass	40% Non-fibrous (Other)	None Detected
LC-157-Run Insulation *042420812-0158*	Basement - B35 - Steam Run	Yellow Fibrous Homogeneous	95% Glass	5% Non-fibrous (Other)	None Detected
LC-157-Backing *042420812-0158A*	Basement - B35 - Steam Run	Tan/White Non-Fibrous Homogeneous	55% Cellulose	45% Non-fibrous (Other)	None Detected
LC-158-Elbow Insulation *042420812-0159*	Basement - B17 - Steam Elbow	Gray Fibrous Homogeneous	55% Min. Wool	45% Non-fibrous (Other)	None Detected
LC-158-Backing *042420812-0159A*	Basement - B17 - Steam Elbow	White Fibrous Homogeneous	55% Cellulose	45% Non-fibrous (Other)	None Detected
LC-159-Elbow Insulation *042420812-0160*	Basement - B27 - Steam Elbow	Gray Fibrous Homogeneous	55% Min. Wool	45% Non-fibrous (Other)	None Detected
LC-159-Backing *042420812-0160A*	Basement - B27 - Steam Elbow	Tan/Blue Fibrous Homogeneous	55% Cellulose	45% Non-fibrous (Other)	None Detected
LC-160-Elbow Insulation *042420812-0161*	Basement - B29 - Steam Elbow	Gray Fibrous Homogeneous	60% Min. Wool	40% Non-fibrous (Other)	None Detected
LC-160-Backing *042420812-0161A*	Basement - B29 - Steam Elbow	White Fibrous Homogeneous	35% Cellulose	65% Non-fibrous (Other)	None Detected
LC-162 *042420812-0162*	Basement - B30 - White Faux Wood Floor	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-163 *042420812-0163*	Exterior - Linden A - East side - 2nd Window from South - White Caulk	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-164 *042420812-0164*	Exterior - Linden B - E Basement Window - Window Glazing	White Fibrous Homogeneous	2% Fibrous (Other)	98% Non-fibrous (Other)	None Detected

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			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
LC-165 *042420812-0165*	Exterior - Linden B - NE Corner - Expansion Joint	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-166 *042420812-0166*	Exterior - Linden B - E Side - 1st Window from North - White Caulk	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-167 *042420812-0167*	Exterior - Linden A - E side - Basement Vent - Gray Caulk	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-168 *042420812-0168*	Exterior - Linden D -West side Basement - 4th Window from North - Window Glazing	Tan/White Fibrous Homogeneous		98% Non-fibrous (Other)	**2% Chrysotile**
LC-169 *042420812-0169*	Exterior - Linden D - East side - 1st Air Vent from South - Light Gray Brittle Caulk	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-170 *042420812-0170*	Exterior - Linden D - East side - Gray Expansion Joint	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

Analyst(s)

Hunter Kelly (50)
Alex Francois (69)
Sean Dyson (66)
Emilie Kalbach (25)

Samantha Rundstrom, Laboratory Manager
or Other Approved Signatory

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Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ NVLAP Lab Code 101048-0, AIHA LAP, LLC-IHLAP Lab 100194, PA ID# 68-00367, LA #04127

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EMSL ANALYTICAL, INC.
LABORATORY · PRODUCTS · TRAINING

Asbestos Chain of Custody (Air, Bulk, Soil)

EMSL Order Number / Lab Use Only: 042420812

EMSL Analytical, Inc.
Cinnaminson, NJ 08077
PHONE: 1-800-220-3675
EMAIL: c@emsl.com

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CINNAMINSON, N.J.
2024 OCT -7 A 10:17

If Bill-To is the same as Report-To leave this section blank. Third-party billing requires written authorization.

Customer Information		Billing Information	
Customer ID:		Billing ID:	
Company Name:	Atlas Technical	Company Name:	Atlas Technical
Contact Name:		Billing Contact:	Steve Hudson
Street Address:	11117 Mockingbird Drive	Street Address:	11117 Mockingbird Drive
City, State, Zip:	Omaha NE 6813	City, State, Zip:	Omaha NE 68137
Country:	US	Country:	US
Phone:	402-697-9747	Phone:	402-697-9747
Email(s) for Report:	eric.l.brown@oneatlas.com	Email(s) for Invoice:	

Project Information

Project Name/No:	WOODWARD TUNNEL SURVEY 204BS074475	Purchase Order:	
EMSL LIMS Project ID: (if applicable, EMSL will provide)		US State where samples collected:	IA
State of Connecticut (CT) must select project location:	☐ Commercial (Taxable) ☐ Residential (Non-Taxable)		
Sampled By Name:	ERIC BROWN	Sampled By Signature:	Eric Brown
No. of Samples in Shipment	170		

Turn-Around-Time (TAT)

☐ 3 Hour ☐ 4-4.5 Hour ☐ 6 Hour ☐ 24 Hour ☐ 32 Hour ☐ 48 Hour ☒ 72 Hour ☐ 96 Hour ☐ 1 Week ☐ 2 Week

TEM Air 3-6 Hour, please call ahead to schedule. 32 Hour TAT available for select tests only; samples must be submitted by 11:30 am.

Test Selection

PCM Air
- ☐ NIOSH 7400
- ☐ NIOSH 7400 w/ 8hr. TWA

PLM - Bulk (reporting limit)
- ☑ PLM EPA 600/R-93/116 (<1%)
- ☐ PLM EPA NOB (<1%)
- ☐ POINT COUNT
  - ☐ 400 (<0.25%) ☐ 1,000 (<0.1%)
- POINT COUNT w/ GRAVIMETRIC
  - ☐ 400 (<0.25%) ☐ 1,000 (<0.1%)
- ☐ NIOSH 9002 (<1%)
- ☐ NYS 198.1 (Friable - NY)
- ☐ NYS 198.6 NOB (Non-Friable - NY)
- ☐ NYS 198.8 (Vermiculite SM-V)

TEM - Air
- ☐ AHERA 40 CFR, Part 763
- ☐ NIOSH 7402
- ☐ EPA Level II
- ☐ ISO 10312*

TEM - Bulk
- ☐ TEM EPA NOB
- ☐ NYS NOB 198.4 (Non-Friable-NY)
- ☐ TEM EPA 600/R-93/116 w Milling Prep (0.1%)

Other Test (please specify)

TEM - Settled Dust
- ☐ Microvac - ASTM D5755
- ☐ Wipe - ASTM D6480
- ☐ Qualitative via Filtration Prep
- ☐ Qualitative via Drop Mount Prep

Soil - Rock - Vermiculite (reporting limit)*
- ☐ PLM EPA 600/R-93/116 with milling prep (<0.25%)
- ☐ PLM EPA 600/R-93/116 with milling prep (<0.1%)
- ☐ TEM EPA 600/R-93/116 with milling prep (<0.1%)
- ☐ TEM Qualitative via Filtration Prep
- ☐ TEM Qualitative via Drop Mount Prep

*Please call with your project-specific requirements.

☐ Positive Stop - Clearly Identified Homogeneous Areas (HA) | Filter Pore Size (Air Samples) ☐ 0.8um ☐ 0.45um

Sample Number	Sample Location / Description	Volume, Area or Homogeneous Area	Date / Time Sampled (Air Monitoring Only)
	See the other sheets		

Special Instructions and/or Regulatory Requirements (Sample Specifications, Processing Methods, Limits of Detection, etc.)

170 GK

Method of Shipment:		Sample Condition Upon Receipt:	
Relinquished by: Eric Brown	Date/Time: 10/4/24 17:00	Received by: Charlene EMSL FX	Date/Time: 10/7/24 9:00
Relinquished by:	Date/Time:	Received by:	Date/Time

Controlled Document - COC-05 Asbestos R15 4/23/2021

☐ AGREE TO ELECTRONIC SIGNATURE (By checking, I consent to signing this Chain of Custody document by electronic signature.)

EMSL Analytical, Inc.'s Laboratory Terms and Conditions are incorporated into this Chain of Custody by reference in their entirety. Submission of samples to EMSL Analytical, Inc. constitutes acceptance and acknowledgment of all terms and conditions by Customer.

042420812

ASBESTOS BULK SAMPLE FORM

ATLAS
11117 Mockingbird Drive
Omaha, NE 68137
Phone (402) 697-9747
Fax (402) 597-8532

Project Information

Client:	Project Description: Linden C+D	Project Manager: Inspector: EB
Date: 10/2/24	Site Location: Woodward	ATLAS PROJECT NUMBER: 204B507475

Sample #	Material Description	Floor	Sample Location	Quantity
LC-1	Brick mortar	2	207	
LC-2	Green tile Grout	2	207	
LC-3	Plaster	2	207	
LC-4	Blue tile Grout	2	205	
LC-5	Red tile Grout	2	215	
LC-6	Dark terrazzo	2	220	
LC-7	Fake wood Floor Coating	2	214	
LC-8	Black Cove base	2	209	
LC-9	tan mastic	2	209	
LC-10	White Cove base	2	205	
LC-11	Cream mastic	2	205	
LC-12	Sink insulation	2	215	2
LC-13	Clear Caulk - Sink	2	206	

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ASBESTOS BULK SAMPLE FORM

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CINNAMINSON, N.J.
2024 OCT -7 A 10:17

ATLAS
11117 Mockingbird Drive
Omaha, NE 68137
Phone (402) 697-9747
Fax (402) 597-8532

Project Information

Client:	Project Description: Linden CTP	Project Manager: SH Inspector: EB
Date: 10/2/24	Site Location: Woodward	ATLAS PROJECT NUMBER: 20485074 75

Sample #	Material Description	Floor	Sample Location	Quantity
LC-14	Window Glazing	2	214	
LC-15	Gray Caulk-window	2	214	
LC-16	Ceilings tile	2	214	
LC-17	Drywall mud	2	214	
LC-18	Light terrazzo (Center)	2	203	
LC-19	Vibation damper	2	201	2
LC-20	Plaster	2	201	
LC-21	Drywall mud	2	[redacted] 237	
LC-22	Plaster	2	220	
LC-23	Vibation Damper	2	229	2
LC-24	Plaster	2	229	
LC-25	[redacted] Drywall	2	229	
LC-26	Fake wood Vinyl Flooring	2	230	

Asbestos

ASBESTOS BULK SAMPLE FORM

ATLAS
11117 Mockingbird Drive
Omaha, NE 68137
Phone (402) 697-9747
Fax (402) 597-8532

Project Information

Client:	Project Description: Linden Ct D	Project Manager: SH Inspector: ES
Date: 10/2/24	Site Location: Woodward	ATLAS PROJECT NUMBER: 20465 07475

Sample #	Material Description	Floor	Sample Location	Quantity
LC-27	White Sheet Flooring	2	232	
LC-28	Cream mastic	2	232	
LC-29	Pink Sheet flooring	2	229	
LC-30	Cream Mastic	2	229	
LC-31	Ceiling tile 2x2	2	229	
LC-32	Drywall mud	2	229	
LC-33	White Caulk	2	Center Window 220	
LC-34	White window Glazing looks like dry wall mud	2	Center Window 220	
LC-35	Window Glazing looks older	2	Center Window 220	
LC-36	Gray Cove Base Painted	1	101	
LC-37	tan Mastic Cove Base	1	101	
LC-38	Pink Sheet floor	1	113	
LC-39	Yellow Sheet floor mastic	1	113	

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ATLAS
11117 Mockingbird Drive
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Phone (402) 697-9747
Fax (402) 597-8532

Project Information

Client:	Project Description: Linden CTD	Project Manager: SH Inspector: EB
Date: 10/2/24	Site Location: Woodward	ATLAS PROJECT NUMBER: 20485074.75

Sample #	Material Description	Floor	Sample Location	Quantity
LC-40	Brown sheet floor	1	112	
LC-41	Cream mastic	1	112	
LC-42	Yellow tile grout	1	105	
LC-43	Green tile Grout	1	103	
LC-44	Brick Mortar	1	103	
LC-45	Plaster	1	103	
LC-46	Gray Satin wood Coating	1	113	
LC-47	Drywall mud	1	113	
LC-48	Plaster	1	113	
LC-49	White Caulk	1	104	
* LC-50	Sink Insulation	1	112	2
LC-51	White Caulk	1	112	
LC-52	Vibation Damper	1	110	2

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ASBESTOS BULK SAMPLE FORM

ATLAS
11117 Mockingbird Drive
Omaha, NE 68137
Phone (402) 697-9747
Fax (402) 597-8532

Project Information

Client:	Project Description: Linden CTD	Project Manager: SH Inspector: EB
Date: 10/2/24	Site Location: Woodward	ATLAS PROJECT NUMBER: 204B507475

Sample #	Material Description	Floor	Sample Location	Quantity
LC-53	TSI Sealant-Pipe	1	110	
LC-54	Ceilings Hlc 2x2	1	113	
LC-55	tan mastic brittle	1	141	4SF
LC-56	Yellow tile grout	1	141	
LC-57	Drywall mud	1	141	
LC-58	Pink Sheet floor	1	130	
LC-59	Pink Sheet floor mastic	1	130	
LC-60	Gray Suke wood floor Coating	1	130	
LC-61	Gray speckled Coatings	1	D North Stairwell	
LC-62	Dry wall mud	1	D North Stairwell	
LC-63	Black cove Base	1	D North stairwell	
LC-64	tan Cove Base mastic	1	D North stairwell	
LC-65	Gray vinyl Suke Wood	1	134	

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ASBESTOS BULK SAMPLE FORM

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CINNAMINSON, N.J.
2024 OCT -7 A 10:17

ATLAS
11117 Mockingbird Drive
Omaha, NE 68137
Phone (402) 697-9747
Fax (402) 597-8532

Project Information

Client:	Project Description: Linden C+D	Project Manager: SH Inspector: EB
Date: 10/2/24	Site Location: Woodward	ATLAS PROJECT NUMBER: 204B507475

Sample #	Material Description	Floor	Sample Location	Quantity
LC-66	2x2 Ceiling tile	1	134	
LC-67	Vibration Bamper	1	133	2
LC-68	TSI Sealant	1	133	
LC-69	Duct Sealant	1	133	
LC-70	Plaster	1	133	
LC-71	Drywall	1	133	
LC-72	White Caulk	1	139	
LC-73	Drywall mud	1	139	
LC-74	Drywall tape	1	139	

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ASBESTOS BULK SAMPLE FORM

ATLAS
11117 Mockingbird Drive
Omaha, NE 68137
Phone (402) 697-9747
Fax (402) 597-8532

Project Information

Client:	Project Description: C&D LINDEN	Project Manager: SH Inspector: EB
Date: 10/3/24	Site Location: WOODWARD	ATLAS PROJECT NUMBER: 2048507475

Sample #	Material Description	Floor	Sample Location	Quantity
LC-75	12"X12" PINK VFT	P	CARDIO ROOM B10	
LC-76	VFT MASTIC	B	" " B10	
LC-77	DRYWALL MUD	B	B10 " " DIVIDING WALL	
LC-78	CAULK WHITE	B	CARDIO ROOM B10 ON DUCT WORK	
LC-79	4" GRAY COVEBASE	B	N. HALL B07	
LC-80	COVE BASE MASTIC	B	N. HALL B07	
LC-81	tan mastic	B	B07	
LC-83	1"X1" CERAMIC TILE YELLOW GRAY GROUT	B	RESTROOM B03	
LC-82	WHITE CAULK	B	RESTROOM B03	
LC-84	4" WHITE COVE BASE	B	RESTROOM B03	
LC-85	COVE BASE MASTIC	B	RESTROOM B03	
LC-86	Drywall mud	B	RESTROOM B05	
LC-87	TSI ELBOW STEAM	B	NURSES OFFICE B01	1

ONLY 1 ELBOW OBSERVED ON "C" SIDE IN BASEMENT

042420812
8

ASBESTOS BULK SAMPLE FORM

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2024 OCT -7 A 10:17

ATLAS
11117 Mockingbird Drive
Omaha, NE 68137
Phone (402) 697-9747
Fax (402) 597-8532

Project Information

Client:	Project Description: LINDEN C&O	Project Manager: SH Inspector: EB
Date: 10/3/24	Site Location: WOODWARD	ATLAS PROJECT NUMBER: 24BS07475

Sample #	Material Description	Floor	Sample Location	Quantity
LC-88	Vibation Damper	B	B10	2
LC-89	TSI - Sealant	B	B10	
LC-90	[redacted] Drywall mud	B	B10	
LC-91	CW Run	B	B07	
LC-92	CW Run	B	B07	
LC-93	CW Run	B	B07	
LC-94	HW Run	B	B07	
LC-95	HW Run	B	B07	
LC-96	HW Run	B	B07	
LC-97	Cir Run	B	B07	
LC-98	Cir Run	B	B07	
LC-99	Cir Run	B	B07	
LC-100	Steam Run	B	B07	

CW = Cold
HW = Hot
Cir = Circulating

042420812

ASBESTOS BULK SAMPLE FORM

ATLAS
11117 Mockingbird Drive
Omaha, NE 68137
Phone (402) 697-9747
Fax (402) 597-8532

Project Information

Client:	Project Description: Linden C+D	Project Manager: SH Inspector: EB
Date: 10/3/24	Site Location: Woodward	ATLAS PROJECT NUMBER: 204BS07475

Sample #	Material Description	Floor	Sample Location	Quantity
LC-101	Steam Run	B	B03	
LC-102	Steam Run	B	B07	
* LC-103	9x9 VFT - Orange	B	B15	500 sq FT
* LC-104	9x9 VFT - Maroon	B	B15	
* LC-105	9x9 VFT tan	B	B15	
* LC-106	9x9 VFT Mastic -Black	B	B15	
LC-107	Plaster	B	B15	
LC-108	Drywall mud	B	B15	
LC-109	Vibation Damper	B	B15	2
LC-110	Black mastic	B	B16	
LC-111	tan mastic	B	B16	
LC-112	12 x 12 Pink VFT	B	B16	
LC-113	LT Brown Fake wood	B	B17	

* 9x9 VFT Mastic Send in B15 + B16

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ASBESTOS BULK SAMPLE FORM

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11117 Mockingbird Drive
Omaha, NE 68137
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Project Information

Client:	Project Description: LINDEN C&D	Project Manager: SH Inspector: EB
Date: 10/3/24	Site Location: WOODWARD	ATLAS PROJECT NUMBER: 204B507475

Sample #	Material Description	Floor	Sample Location	Quantity
LC-114	4" GRAY COVE BASE	B	B117	
LC-115	COVE BASE MASTIC	B	B117	
LC-116	4" Dark Gray Cove Base	B	B18	
LC-117	Cove Base mastic	B	B18	
LC-118	Drywall mud	B	B21	
LC-119	Drywall tape	B	B21	
LC-120	Vibation Bumper	B	B21	
LC-121	TSI Sealant	B	B21	
LC-122	Drywall	B	B17	
LC-123	red Sheet floor	B	B24	40 sq ft
LC-124	Black mastic	B	B24	
LC-125	tan mastic	B	B24	
LC-126	12 x 12 White VFT	B	B19	

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Project Information

Client:	Project Description: Linden C+D	Project Manager: SH Inspector: EB
Date: 10/3/24	Site Location: Woodward	ATLAS PROJECT NUMBER: 204BS07475

Sample #	Material Description	Floor	Sample Location	Quantity
LC-127	tan mastic	B	B19	
LC-128	Salmon sheet flor	B	B26	
LC-129	Black mastic	B	B26	
LC-130	Drywall mud	B	B31	
LC-131	Drywall mud	B	B17	
LC-132	4" Black Cove Base	B	~~B17~~ B32	
LC-133	Cove Base mastic	B	~~B17~~ B32	
LC-134	Gray Sahara wood	B	B34	
LC-135	Brown floor tile Grout	B	B27	
LC-136	6in White Cove Base	B	B27	
LC-137	Cove Base mastic	B	B27	

ASBESTOS BULK SAMPLE FORM

Page ___ of _

ATLAS
11117 Mockingbird Drive
Omaha, NE 68137
Phone (402) 697-9747
Fax (402) 597-8532

Project Information

Client:	Project Description:	Project Manager: Inspector:
Date:	Site Location:	ATLAS PROJECT NUMBER:

Sample #	Material Description	Floor	Sample Location	Quantity

042420812

ASBESTOS BULK SAMPLE FORM

ATLAS
11117 Mockingbird Drive
Omaha, NE 68137
Phone (402) 697-9747
Fax (402) 597-8532

Project Information

Client:	Project Description: Linden C+D	Project Manager: SH Inspector: EB
Date: 10/4/24	Site Location: Woodward	ATLAS PROJECT NUMBER: 204B507475

Sample #	Material Description	Floor	Sample Location	Quantity
LC 138	CW Run	B	B17	
LC 139	CW Run	B	B17	
LC 140	CW Run	B	B17	
LC 161	CW Elbow	B	B17	
LC 141	CW Elbow	B	B17	
LC 142	CW Elbow	B	B17	
LC 143	HW Run	B	B17	
LC 144	HW Run	B	B17	
LC 145	HW Run	B	B17	
LC 146	HW Elbow	B	B17	
LC 147	HW Elbow	B	B17	
LC 148	HW Elbow	B	B17	
LC 149	Cir Run	B	B17	

CW = Cold water

HW = Hot water

Cir = Circulation water

042420812

ASBESTOS BULK SAMPLE FORM

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ATLAS
11117 Mockingbird Drive
Omaha, NE 68137
Phone (402) 697-9747
Fax (402) 597-8532

Project Information

Client:	Project Description: Linden CTP	Project Manager: SH Inspector: EB
Date: 10/4/24	Site Location: Woodward	ATLAS PROJECT NUMBER: 204B507475

Sample #	Material Description	Floor	Sample Location	Quantity
LC 150	Cir Run	B	B17	
LC 151	Cir Run	B	B17	
LC 152	Cir Elbow	B	B17	
LC 153	Cir Elbow	B	B17	
LC 154	Cir Elbow	B	B17	
LC 155	Steam Run	B	B17	
LC 156	Steam Run	B	B26	
LC 157	Steam Run	B	B35	
LC 158	Steam Elbow	B	B17	
LC 159	Steam Elbow	B	B27	
LC 160	Steam Elbow	B	B29	
LC 162	White Sealk wood floor	B	B30	
LC 163	East Side 2nd Window from South Linden A	E	White Caulk	

Cir = Circulating water

042480812

ASBESTOS BULK SAMPLE FORM

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2024 OCT -7 A 10:17

ATLAS
11117 Mockingbird Drive
Omaha, NE 68137
Phone (402) 697-9747
Fax (402) 597-8532

Project Information

Client:	Project Description: LINDEN C & D	Project Manager: SH Inspector: EB
Date: 10/4/24	Site Location: WOODWARD	ATLAS PROJECT NUMBER: 204BS07475

Sample #	Material Description	Floor	Sample Location	Quantity
LC-164	WINDOW GLAZING	E	LINDEN B E BASEMENT WINDOW	
LC-165	EXPANSION JOINT	E	LINDEN B NE CORNER	
LC-166	WHITE CAULK	E	LINDEN B E SIDE 1ST WINDOW FROM NORTH	
LC-167	CAULK GRAY	E	LINDEN A E. SIDE BASEMENT VENT	
LC-168	WINDOW GLAZING	E	WEST SIDE LINDEN D BASEMENT 4TH WINDOW FROM NORTH	
LC-169	CAULK LIGHT GRAY BRITTLE	E	EAST ~~WEST~~ SIDE LINDEN D 1ST AIRVENT FROM SOUTH	
LC-170	EXPANSION JOINT GRAY	E	EAST ~~WEST~~ SIDE LINDEN D	

E = EXTERIOR

EMSL Analytical, Inc.
200 Route 130 North Cinnaminson, NJ 08077
Tel/Fax: (800) 220-3675 / (856) 786-5974
http://www.EMSL.com / cinnasblab@EMSL.com

EMSL Order:	042424166
Customer ID:	ATC55
Customer PO:	
Project ID:	

Attention:	Eric Brown	**Phone:**	(402) 697-9747
	Atlas Technical	**Fax:**	(402) 597-8532
	11117 Mockingbird Drive	**Received Date:**	11/22/2024 9:35 AM
	Omaha, NE 68137	**Analysis Date:**	11/25/2024
		Collected Date:	11/20/2024
Project:	Woodward Tunnels / 204BS07475		

Test Report: Asbestos Analysis of Bulk Materials via AHERA Method 40CFR 763 Subpart E Appendix E supplemented with EPA 600/R-93/116 using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
LC-171 *042424166-0001*	Linden C&D Mechanical Room 133 - HVAC Duct Insulation	Gray Fibrous Homogeneous	95% Glass	5% Non-fibrous (Other)	None Detected
LC-172 *042424166-0002*	Linden C&D Mechanical Room 229 - HVAC Duct Insulation	Gray Fibrous Homogeneous	90% Glass	10% Non-fibrous (Other)	None Detected

Analyst(s)
Brett Teixeira (2)

Samantha Rundstrom, Laboratory Manager
or Other Approved Signatory

EMSL maintains liability limited to cost of analysis. Interpretation and use of test results are the responsibility of the client. This report relates only to the samples reported above, and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. The report reflects the samples as received. Results are generated from the field sampling data (sampling volumes and areas, locations, etc.) provided by the client on the Chain of Custody. Samples are within quality control criteria and met method specifications unless otherwise noted. The above analyses were performed in general compliance with Appendix E to Subpart E of 40 CFR (previously EPA 600/M4-82-020 “Interim Method”) but augmented with procedures outlined in the 1993 (”final”) version of the method. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the federal government. Non-friable organically bound materials present a problem matrix and therefore EMSL recommends gravimetric reduction prior to analysis. Unless requested by the client, building materials manufactured with multiple layers (i.e. linoleum, wallboard, etc.) are reported as a single sample. Estimation of uncertainty is available on request.

Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ NVLAP Lab Code 101048-0, AIHA LAP, LLC-IHLAP Lab 100194, PA ID# 68-00367, LA #04127

Initial report from: 11/25/2024 09:03:43

OrderID: 042424166

Asbestos Chain of Custody (Air, Bulk, Soil)

EMSL Analytical, Inc.

EMSL Order Number / Lab Use Only: 042424166

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Cinnaminson, NJ 08077
PHONE: 1-800-220-3675
EMAIL: c@emsl.com

If Bill-To is the same as Report-To leave this section blank. Third-party billing requires written authorization.

Customer Information		Billing Information	
Customer ID:		Billing ID:	
Company Name:	Atlas Technical	Company Name:	Atlas Technical
Contact Name:		Billing Contact:	Steve Hudson
Street Address:	11117 Mockingbird Drive	Street Address:	11117 Mockingbird Drive
City, State, Zip:	Omaha NE 6813	City, State, Zip:	Omaha NE 68137
Country:	US	Country:	US
Phone:	402-697-9747	Phone:	402-697-9747
Email(s) for Report:	eric.l.brown@oneatlas.com	Email(s) for Invoice:	

Project Information

Project Name/No:	WOODWARD TUNNELS 204B507475	Purchase Order:	
EMSL LIMS Project ID: (If applicable, EMSL will provide)		US State where samples collected:	IA
State of Connecticut (CT) must select project location:	☐ Commercial (Taxable) ☐ Residential (Non-Taxable)		
Sampled By Name:	ERIC BROWN	Sampled By Signature:	Eric Brown
No. of Samples in Shipment	2		

Turn-Around-Time (TAT)

☐ 3 Hour ☐ 4-4.5 Hour ☐ 6 Hour ☐ 24 Hour ☐ 32 Hour ☒ 48 Hour ☐ 72 Hour ☐ 96 Hour ☐ 1 Week ☐ 2 Week

TEM Air 3-6 Hour, please call ahead to schedule. 32 Hour TAT available for select tests only; samples must be submitted by 11:30 am.

Test Selection

PCM Air
- ☐ NIOSH 7400
- ☐ NIOSH 7400 w/ 8hr. TWA

PLM - Bulk (reporting limit)
- ☑ PLM EPA 600/R-93/116 (<1%)
- ☐ PLM EPA NOB (<1%)
- ☐ POINT COUNT
  - ☐ 400 (<0.25%) ☐ 1,000 (<0.1%)
- POINT COUNT w/ GRAVIMETRIC
  - ☐ 400 (<0.25%) ☐ 1,000 (<0.1%)
- ☐ NIOSH 9002 (<1%)
- ☐ NYS 198.1 (Friable - NY)
- ☐ NYS 198.6 NOB (Non-Friable - NY)
- ☐ NYS 198.8 (Vermiculite SM-V)

TEM - Air
- ☐ AHERA 40 CFR, Part 763
- ☐ NIOSH 7402
- ☐ EPA Level II
- ☐ ISO 10312*

TEM - Bulk
- ☐ TEM EPA NOB
- ☐ NYS NOB 198.4 (Non-Friable-NY)
- ☐ TEM EPA 600/R-93/116 w Milling Prep (0.1%)

Other Test (please specify)

TEM - Settled Dust
- ☐ Microvac - ASTM D5755
- ☐ Wipe - ASTM D6480
- ☐ Qualitative via Filtration Prep
- ☐ Qualitative via Drop Mount Prep

Soil - Rock - Vermiculite (reporting limit)*
- ☐ PLM EPA 600/R-93/116 with milling prep (<0.25%)
- ☐ PLM EPA 600/R-93/116 with milling prep (<0.1%)
- ☐ TEM EPA 600/R-93/116 with milling prep (<0.1%)
- ☐ TEM Qualitative via Filtration Prep
- ☐ TEM Qualitative via Drop Mount Prep

*Please call with your project-specific requirements.

☐ Positive Stop - Clearly Identified Homogeneous Areas (HA) | Filter Pore Size (Air Samples) ☐ 0.8um ☐ 0.45um

Sample Number	Sample Location / Description	Volume, Area or Homogeneous Area	Date / Time Sampled (Air Monitoring Only)
	See the other sheets		

RECEIVED EMSL CINNAMINSON, NJ 2024 NOV 22 A 11:52

Special Instructions and/or Regulatory Requirements (Sample Specifications, Processing Methods, Limits of Detection, etc.)

DO NOT ANALYZE THE FOIL IN LC-172

Method of Shipment:			Sample Condition Upon Receipt:		
Relinquished by:	Eric Brown	Date/Time: 11/21/24 17:00	Received by:	EF+	Date/Time 11/22/24 9:35
Relinquished by:		Date/Time:	Received by:		Date/Time

Controlled Document - COC-05 Asbestos R15 4/23/2021

☐ AGREE TO ELECTRONIC SIGNATURE (By checking, I consent to signing this Chain of Custody document by electronic signature.)

EMSL Analytical, Inc.'s Laboratory Terms and Conditions are incorporated into this Chain of Custody by reference in their entirety. Submission of samples to EMSL Analytical, Inc. constitutes acceptance and acknowledgment of all terms and conditions by Customer.

OrderID: 042424166

042424166

ASBESTOS BULK SAMPLE FORM

ATLAS
11117 Mockingbird Drive
Omaha, NE 68137
Phone (402) 697-9747
Fax (402) 597-8532

Project Information

Client:	Project Description: WOODWARD TUNNELS	Project Manager: PT Inspector: EB
Date: 11/20/24	Site Location: WOODWARD	ATLAS PROJECT NUMBER: 204BS07475

Sample #	Material Description	Floor	Sample Location	Quantity
LC-171	HVAC DUCT INSULATION		LINDEN C&D MECHANICAL ROOM 133	
LC-172	HVAC DUCT INSULATION		LINDEN C&D MECHANICAL ROOM 229	

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CINNAMINSON, NJ
2024 NOV 22 A 11:52

EMSL Analytical, Inc.

200 Route 130 North Cinnaminson, NJ 08077
Tel/Fax: (800) 220-3675 / (856) 786-5974
http://www.EMSL.com / cinnasblab@EMSL.com

EMSL Order:	042524935
Customer ID:	ATC55
Customer PO:	
Project ID:	

Attention:	Phil Thomas	**Phone:**	(402) 697-9747
	Atlas Technical	**Fax:**	(402) 597-8532
	11117 Mockingbird Drive	**Received Date:**	12/24/2025 1:00 PM
	Omaha, Nebraska 68137	**Analysis Date:**	12/26/2025
		Collected Date:	12/22/2025

Project: 204BS09286/State of Iowa/Linden Court A/B;C/D/Woodword Resource Center

Test Report: Asbestos Analysis of Bulk Materials via AHERA Method 40CFR 763 Subpart E Appendix E supplemented with EPA 600/R-93/116 using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
LD-200 *042524935-0001*	1st Floor-Linden D-142 Corridor - Plaster Ceiling	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LD-201 *042524935-0002*	1st Floor-Linden D-142 Corridor - Acoustical Texture Ceiling	Tan Fibrous Homogeneous		80% Non-fibrous (Other)	**20% Chrysotile**
LD-203 *042524935-0003*	1st Floor-Linden D-132 Living - Plaster Ceiling	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LD-204 *042524935-0004*	1st Floor-Linden D-132 Living - Acoustical Texture Ceiling	Tan Fibrous Homogeneous		80% Non-fibrous (Other)	**20% Chrysotile**
LD-205 *042524935-0005*	1st Floor-Linden D-132 Living - Plaster Wall	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LD-206 *042524935-0006*	1st Floor-Linden D-132 Living - Skim Coat Wall	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LD-207 *042524935-0007*	1st Floor-Linden C/D-Mech. 133 - Plaster Wall	Gray/White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LD-208 *042524935-0008*	1st Floor-Linden C/D-Mech. 133 - Skim Coat Wall	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LD-209 *042524935-0009*	1st Floor-Linden C/D-Corridor 120 - Plaster Ceiling				**Layer Not Present**
LD-210 *042524935-0010*	1st Floor-Linden C/D-Corridor 120 - Acoustical Texture Ceiling	Tan Fibrous Homogeneous		75% Non-fibrous (Other)	**25% Chrysotile**
LD-211 *042524935-0011*	2nd Floor-Linden C-Mech. 211 - Plaster Wall	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-212 *042524935-0012*	2nd Floor-Linden C-Mech. 211 - Skim Coat	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-213 *042524935-0013*	1st Floor-Linden C-Corridor 107 - Plaster Ceiling	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-214 *042524935-0014*	1st Floor-Linden C-Corridor 107 - Acoustical Texture Ceiling	Tan Fibrous Homogeneous		80% Non-fibrous (Other)	**20% Chrysotile**

Initial report from: 12/27/2025 10:50:19

EMSL Analytical, Inc.
200 Route 130 North Cinnaminson, NJ 08077
Tel/Fax: (800) 220-3675 / (856) 786-5974
http://www.EMSL.com / cinnasblab@EMSL.com

EMSL Order:	042524935
Customer ID:	ATC55
Customer PO:	
Project ID:	

Test Report: Asbestos Analysis of Bulk Materials via AHERA Method 40CFR 763 Subpart E Appendix E supplemented with EPA 600/R-93/116 using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
LC-215 *042524935-0015*	1st Floor-Corridor 161 Connecting All Building - Plaster Ceiling	Orange Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-216 *042524935-0016*	1st Floor-Corridor 161 Connecting All Building - Acoustical Texture Ceiling	Tan Fibrous Homogeneous		80% Non-fibrous (Other)	**20% Chrysotile**
LC-217 *042524935-0017*	1st Floor-Corridor 161 C Linden B Transition Door/Header - Plaster Wall	White Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
LC-218 *042524935-0018*	1st Floor-Corridor 161 C Linden B Transition Door/Header - Skim Coat Wall	White Non-Fibrous Homogeneous		95% Non-fibrous (Other)	**5% Chrysotile**

Analyst(s)

Juliet Mulcahy (8)
Kiara Secula (7)
Russell Hayden (2)

Samantha Sweeney

Samantha Sweeney, Laboratory Manager
or Other Approved Signatory

EMSL maintains liability limited to cost of analysis. Interpretation and use of test results are the responsibility of the client. This report relates only to the samples reported above, and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. The report reflects the samples as received. Results are generated from the field sampling data (sampling volumes and areas, locations, etc.) provided by the client on the Chain of Custody. Samples are within quality control criteria and met method specifications unless otherwise noted. The above analyses were performed in general compliance with Appendix E to Subpart E of 40 CFR (previously EPA 600/M4-82-020 “Interim Method”) but augmented with procedures outlined in the 1993 (”final”) version of the method. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the federal government. Non-friable organically bound materials present a problem matrix and therefore EMSL recommends gravimetric reduction prior to analysis. Unless requested by the client, building materials manufactured with multiple layers (i.e. linoleum, wallboard, etc.) are reported as a single sample. Estimation of uncertainty is available on request.

Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ NVLAP Lab Code 101048-0, AIHA LAP, LLC-IHLAP Lab 100194, PA ID# 68-00367, LA #04127

Initial report from: 12/27/2025 10:50:19

OrderID: 042524935

Asbestos Chain of Custody (Air, Bulk, Soil)

EMSL Order Number / Lab Use Only: 042524935

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

EMSL Analytical, Inc.
200 Route 130 North
Cinnaminson, NJ 08077
PHONE: 1-800-220-3675
EMAIL: c@emsl.com

If Bill-To is the same as Report-To leave this section blank. Third-party billing requires written authorization.

Customer Information		Billing Information	
Customer ID:		Billing ID:	
Company Name:	Atlas Technical	Company Name:	Atlas Technical
Contact Name:	Phil Thomas	Billing Contact:	Accounting
Street Address:	11117 Mockingbird Drive	Street Address:	11117 Mockingbird Drive
City, State, Zip:	Omaha NE 68137 Country: US	City, State, Zip:	Omaha NE 68137 Country: US
Phone:	402-697-9747	Phone:	402-697-9747
Email(s) for Report:	phil.thomas@oneatlas.com	Email(s) for Invoice:	

Project Information

Project Name/No: 204B509286 - WRC, Linden A/B; C/D
Purchase Order:
EMSL LIMS Project ID: (If applicable, EMSL will provide)
US State where samples collected: NE
State of Connecticut (CT) must select project location: ☐ Commercial (Taxable) ☐ Residential (Non-Taxable)
Sampled By Name:
Sampled By Signature:
No. of Samples in Shipment

Turn-Around-Time (TAT)

☐ 3 Hour ☐ 4-4.5 Hour ☐ 6 Hour ☒ 24 Hour ☐ 32 Hour ☐ 48 Hour ☐ 72 Hour ☐ 96 Hour ☐ 1 Week ☐ 2 Week

TEM Air 3-6 Hour, please call ahead to schedule. 32 Hour TAT available for select tests only; samples must be submitted by 11:30 am.

Test Selection

PCM Air
- ☐ NIOSH 7400
- ☐ NIOSH 7400 w/ 8hr. TWA

PLM - Bulk (reporting limit)
- ☒ PLM EPA 600/R-93/116 (<1%)
- ☐ PLM EPA NOB (<1%)
- ☐ POINT COUNT
  - ☐ 400 (<0.25%) ☐ 1,000 (<0.1%)
- POINT COUNT w/ GRAVIMETRIC
  - ☐ 400 (<0.25%) ☐ 1,000 (<0.1%)
- ☐ NIOSH 9002 (<1%)
- ☐ NYS 198.1 (Friable - NY)
- ☐ NYS 198.6 NOB (Non-Friable - NY)
- ☐ NYS 198.8 (Vermiculite SM-V)

TEM - Air
- ☐ AHERA 40 CFR, Part 763
- ☐ NIOSH 7402
- ☐ EPA Level II
- ☐ ISO 10312*

TEM - Bulk
- ☐ TEM EPA NOB
- ☐ NYS NOB 198.4 (Non-Friable-NY)
- ☐ TEM EPA 600/R-93/116 w Milling Prep (0.1%)

Other Test (please specify)

TEM - Settled Dust
- ☐ Microvac - ASTM D5755
- ☐ Wipe - ASTM D6480
- ☐ Qualitative via Filtration Prep
- ☐ Qualitative via Drop Mount Prep

Soil - Rock - Vermiculite (reporting limit)*
- ☐ PLM EPA 600/R-93/116 with milling prep (<0.25%)
- ☐ PLM EPA 600/R-93/116 with milling prep (<0.1%)
- ☐ TEM EPA 600/R-93/116 with milling prep (<0.1%)
- ☐ TEM Qualitative via Filtration Prep
- ☐ TEM Qualitative via Drop Mount Prep

*Please call with your project-specific requirements.

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☐ Positive Stop - Clearly Identified Homogeneous Areas (HA) | Filter Pore Size (Air Samples) ☐ 0.8um ☐ 0.45um

Sample Number	Sample Location / Description	Volume, Area or Homogeneous Area	Date / Time Sampled (Air Monitoring Only)
1	See Attached Sheets		

Special Instructions and/or Regulatory Requirements (Sample Specifications, Processing Methods, Limits of Detection, etc.)

Method of Shipment:		Sample Condition Upon Receipt:	
Relinquished by:	Date/Time: 12/23/2025	Received by: FEDEX	Date/Time 12/24/25
Relinquished by:	Date/Time:	Received by:	Date/Time

Controlled Document - COC-05 Asbestos R15 4/23/2021

☐ AGREE TO ELECTRONIC SIGNATURE (By checking, I consent to signing this Chain of Custody document by electronic signature.)

EMSL Analytical, Inc.'s Laboratory Terms and Conditions are incorporated into this Chain of Custody by reference in their entirety. Submission of samples to EMSL Analytical, Inc. constitutes acceptance and acknowledgment of all terms and conditions by Customer.

18 MK

OrderID: 042524935

042524935

ASBESTOS BULK SAMPLE LOG

ATLAS
11117 Mockingbird Drive
Omaha, NE 68137
Phone (402) 697-9747
Fax (402) 597-8532

Client:	Project Description:	Inspector:
State of Iowa	Linden Court A/B i C/D	P. Thomas
Date:	**Site Location:**	**Atlas Project Number:**
12/22/25	Woodward Resource Center	204B509286

Sample #	Material Description	Floor	Sample Location	Quantity
LD-200	Plaster Ceiling	1st	Linden D - 142 Corridor	
LD-201	Acoustical Texture Ceiling	1st	Linden D - 142 Corridor	
LD-203	Plaster Ceiling	1st	Linden D - 132 Living	
LD-204	Acoustical Texture Ceiling	1st	Linden D - 132 Living	
LD-205	Plaster Wall	1st	"	
LD-206	~~Plaster~~ Skim Coat Wall	1st	"	
LD-207	Plaster Wall	1st	Linden D - Mech. 133	
LD-208	Skim Coat Wall	"	"	
LD-209	Plaster Ceiling	1st	Linden C/D - Corridor 120	
LD-210	Acoustical Texture Ceiling	"	"	
LC-211	Plaster Wall	2nd	Linden C - Mech 241	
LC-212	Skim Coat	2nd	"	
LC-213	Plaster Ceiling	1st	Linden C - Corridor 107	
LC-214	Acoustical Texture Ceiling	1st	"	

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2025 DEC 24 P 12:06

Page ___ of ___

OrderID: 042524935

042524935

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Omaha, NE 68137
Phone: (402) 697-9747
Fax: (402 597-8532

ATLAS

Asbestos Bulk Sampling Log

Sample #	Material Description	Floor	Sample Location	Quantity
LC-215	Plaster Ceiling	1st	Corridor 161 connecting all Building	
LC-216	Acoustical Ceiling Texture	1	1	
LB-217	Plaster Wall	1st	Corridor 161 @ Linden B Transition Door/Header	
LB-218	Skim Coat Wall	1st	1	

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Page ___ of ___

APPENDIX B

LEAD PAINT ANALYTICAL RESULTS AND CHAIN OF CUSTODY

EMSL Analytical, Inc.

200 Route 130, Cinnaminson, NJ, 08077
Telephone: 856-858-4800 Fax:856-786-5974
EMSL-CIN-01

EMSL Order ID: 012432694
LIMS Reference ID: AC32694
EMSL Customer ID: ATC55

Attention: Steve Hudson
Atlas Technical [ATC55]
11117 Mockingbird Drive
Omaha, NE 68137
(402) 697-9747
steve.hudson@oneatlas.com

Project Name: Woodward Tunnel Survey // 204BS07475
Customer PO:
EMSL Sales Rep: Anthony DeRosa
Received: 10/07/2024 09:00
Reported: 10/10/2024 17:53

Analytical Results

Analyte	Results	RL	Weight(g)	Prep Date & Tech	Prep Method	Analysis Date & Analyst	Analytical Method	Q	DF
Client Sample ID: PCLC - 1/Green - Plaster - Linden C - Rm 202									**Date Sampled: 10/02/24**
Matrix: Chips									**LIMS Reference ID: AC32694-01**
Lead	0.075 % wt	0.008 % wt	0.2647	10/09/24 LP	SW-846 3050B	10/10/24 PMX	SW846-7000B		1
Sample Comments:									
Client Sample ID: PCLC - 2/Orange - Brick - Rm 202									**Date Sampled: 10/02/24**
Matrix: Chips									**LIMS Reference ID: AC32694-02**
Lead	<0.008 % wt	0.008 % wt	0.2938	10/09/24 LP	SW-846 3050B	10/10/24 PMX	SW846-7000B		1
Sample Comments:									
Client Sample ID: PCLC - 3/Light Blue - Brick - Rm 202									**Date Sampled: 10/02/24**
Matrix: Chips									**LIMS Reference ID: AC32694-03**
Lead	<0.008 % wt	0.008 % wt	0.2757	10/09/24 LP	SW-846 3050B	10/10/24 PMX	SW846-7000B		1
Sample Comments:									
Client Sample ID: PCLC - 4/Dark Gray - Blue -- Metal - Rm 215									**Date Sampled: 10/02/24**
Matrix: Chips									**LIMS Reference ID: AC32694-04**
Lead	<0.008 % wt	0.008 % wt	0.2967	10/09/24 LP	SW-846 3050B	10/10/24 PMX	SW846-7000B		1
Sample Comments:									
Client Sample ID: PCLC - 5/Dark Blue -- Metal - Rm 214									**Date Sampled: 10/02/24**
Matrix: Chips									**LIMS Reference ID: AC32694-05**
Lead	<0.008 % wt	0.008 % wt	0.2771	10/09/24 LP	SW-846 3050B	10/10/24 PMX	SW846-7000B		1
Sample Comments:									
Client Sample ID: PCLC - 6/Gray - Brick - Rm 214									**Date Sampled: 10/02/24**
Matrix: Chips									**LIMS Reference ID: AC32694-06**
Lead	<0.008 % wt	0.008 % wt	0.2729	10/09/24 LP	SW-846 3050B	10/10/24 PMX	SW846-7000B		1
Sample Comments:									
Client Sample ID: PCLC - 7/CMU - Brick - Rm 206									**Date Sampled: 10/02/24**
Matrix: Chips									**LIMS Reference ID: AC32694-07**
Lead	<0.008 % wt	0.008 % wt	0.2516	10/09/24 LP	SW-846 3050B	10/10/24 PMX	SW846-7000B		1
Sample Comments:									
Client Sample ID: PCLC - 8/Tan - CMU - Rm 206									**Date Sampled: 10/02/24**
Matrix: Chips									**LIMS Reference ID: AC32694-08**
Lead	<0.008 % wt	0.008 % wt	0.2882	10/09/24 LP	SW-846 3050B	10/10/24 PMX	SW846-7000B		1
Sample Comments:									
Client Sample ID: PCLC - 9/Light Green - Plaster - Rm 227									**Date Sampled: 10/02/24**
Matrix: Chips									**LIMS Reference ID: AC32694-09**
Lead	<0.008 % wt	0.008 % wt	0.2588	10/09/24 LP	SW-846 3050B	10/10/24 PMX	SW846-7000B		1
Sample Comments:									

EMSL Analytical, Inc.

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Telephone: 856-858-4800 Fax:856-786-5974
EMSL-CIN-01

EMSL Order ID: 012432694
LIMS Reference ID: AC32694
EMSL Customer ID: ATC55

Attention: Steve Hudson
Atlas Technical [ATC55]
11117 Mockingbird Drive
Omaha, NE 68137
(402) 697-9747
steve.hudson@oneatlas.com

Project Name: Woodward Tunnel Survey // 204BS07475
Customer PO:
EMSL Sales Rep: Anthony DeRosa
Received: 10/07/2024 09:00
Reported: 10/10/2024 17:53

Analytical Results (Continued)

Analyte	Results	RL	Weight(g)	Prep Date & Tech	Prep Method	Analysis Date & Analyst	Analytical Method	Q	DF
Client Sample ID: PCLC - 10/Dark Gray - Brick - Rm 229									**Date Sampled: 10/02/24**
Matrix: Chips									**LIMS Reference ID: AC32694-10**
Lead	<0.008 % wt	0.008 % wt	0.2812	10/09/24 LP	SW-846 3050B	10/10/24 PMX	SW846-7000B		1
Sample Comments:									
Client Sample ID: PCLC - 11/Black - Brick - Rm 135									**Date Sampled: 10/02/24**
Matrix: Chips									**LIMS Reference ID: AC32694-11**
Lead	<0.008 % wt	0.008 % wt	0.2585	10/09/24 LP	SW-846 3050B	10/10/24 PMX	SW846-7000B		1
Sample Comments:									
Client Sample ID: PCLC - 12/Purple - Brick - Rm 135									**Date Sampled: 10/02/24**
Matrix: Chips									**LIMS Reference ID: AC32694-12**
Lead	<0.008 % wt	0.008 % wt	0.2725	10/09/24 LP	SW-846 3050B	10/10/24 PMX	SW846-7000B		1
Sample Comments:									
Client Sample ID: PCLC - 13/Grayish Blue - Plaster/Concrete - B07									**Date Sampled: 10/03/24**
Matrix: Chips									**LIMS Reference ID: AC32694-13**
Lead	<0.008 % wt	0.008 % wt	0.265	10/09/24 LP	SW-846 3050B	10/10/24 PMX	SW846-7000B		1
Sample Comments:									
Client Sample ID: PCLC - 14/Off-White - Concrete - B07									**Date Sampled: 10/03/24**
Matrix: Chips									**LIMS Reference ID: AC32694-14**
Lead	0.013 % wt	0.008 % wt	0.2623	10/09/24 LP	SW-846 3050B	10/10/24 PMX	SW846-7000B		1
Sample Comments:									
Client Sample ID: PCLC - 15/White - Concrete - B07									**Date Sampled: 10/03/24**
Matrix: Chips									**LIMS Reference ID: AC32694-15**
Lead	<0.008 % wt	0.008 % wt	0.269	10/09/24 LP	SW-846 3050B	10/10/24 PMX	SW846-7000B		1
Sample Comments:									
Client Sample ID: PCLC - 16/Blue - Metal - B07 Handrail									**Date Sampled: 10/03/24**
Matrix: Chips									**LIMS Reference ID: AC32694-16**
Lead	<0.008 % wt	0.008 % wt	0.2573	10/09/24 LP	SW-846 3050B	10/10/24 PMX	SW846-7000B		1
Sample Comments:									
Client Sample ID: PCLC - 17/Black - Metal - B01 Handrail									**Date Sampled: 10/03/24**
Matrix: Chips									**LIMS Reference ID: AC32694-17**
Lead	<0.008 % wt	0.008 % wt	0.2887	10/09/24 LP	SW-846 3050B	10/10/24 PMX	SW846-7000B		1
Sample Comments:									
Client Sample ID: PCLC - 18/Lt Blue - Concrete - B01 Wall									**Date Sampled: 10/03/24**
Matrix: Chips									**LIMS Reference ID: AC32694-18**
Lead	<0.008 % wt	0.008 % wt	0.28	10/09/24 LP	SW-846 3050B	10/10/24 PMX	SW846-7000B		1
Sample Comments:									

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EMSL-CIN-01

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LIMS Reference ID: AC32694
EMSL Customer ID: ATC55

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Project Name: Woodward Tunnel Survey // 204BS07475
Customer PO:
EMSL Sales Rep: Anthony DeRosa
Received: 10/07/2024 09:00
Reported: 10/10/2024 17:53

Analytical Results (Continued)

Analyte	Results	RL	Weight(g)	Prep Date & Tech	Prep Method	Analysis Date & Analyst	Analytical Method	Q	DF
Client Sample ID: PCLC - 19/Beige - Drywall - B17 Wall									**Date Sampled: 10/03/24**
Matrix: Chips									**LIMS Reference ID: AC32694-19**
Lead	0.020 % wt	0.008 % wt	0.2768	10/09/24 LP	SW-846 3050B	10/10/24 PMX	SW846-7000B		1
Sample Comments:									
Client Sample ID: PCLC - 20/Speckled Blue - Concrete - North Stairwell D									**Date Sampled: 10/03/24**
Matrix: Chips									**LIMS Reference ID: AC32694-20**
Lead	<0.008 % wt	0.008 % wt	0.2548	10/09/24 LP	SW-846 3050B	10/10/24 PMX	SW846-7000B		1
Sample Comments:									

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Project Name: Woodward Tunnel Survey // 204BS07475
Customer PO:
EMSL Sales Rep: Anthony DeRosa
Received: 10/07/2024 09:00
Reported: 10/10/2024 17:53

Certified Analyses included in this Report

Analyte	Certifications
SW846-7000B in Chips	
Lead	AIHA LAP

List of Certifications

Code	Description	Number	Expires
NJDEP	New Jersey Department of Environmental Protection	03036	06/30/2025
AIHA LAP	EMSL Analytical, Inc. Cinnaminson, NJ AIHA-LAP, LLC-ELLAP Accredited	100194	01/01/2025
NYSDOH	New York State Department of Health	10872	04/01/2025
California ELAP	California Water Boards	1877	06/30/2025
A2LA	A2LA Environmental Certificate	2845.01	07/31/2026
PADEP	Pennsylvania Department of Environmental Protection	68-00367	11/30/2024
MADEP	Massachusetts Department of Environmental Protection	M-NJ337	06/30/2025
CTDPH	Connecticut Department of Public Health	PH-0270	06/23/2026

Please see the specific Field of Testing (FOT) on www.emsl.com <http://www.emsl.com> for a complete listing of parameters for which EMSL is certified.

Notes and Definitions

Item	Definition
(Dig)	For metals analysis, sample was digested.
[2C]	Reported from the second channel in dual column analysis.
DF	Dilution Factor
MDL	Method Detection Limit.
ND	Analyte was NOT DETECTED at or above the detection limit.
NR	Spike/Surrogate showed no recovery.
Q	Qualifier
RL	Reporting Limit
	For paint chips, the RL is 0.008% by wt. (equiv. to 80 mg/kg, or ppm) based upon a minimum sample weight of 0.25 grams.
	For soils, the RL is 40 mg/kg (ppm) based upon a minimum sample weight of 0.5 grams.
	For dust wipes, the RL is 10 µg/wipe; reporting units of µg/sq. ft. are not validated by the lab based upon data provided by non-lab personnel.
Wet	Sample is not dry weight corrected.

Measurement of uncertainty and any applicable definitions of method modifications are available upon request. Per EPA NLLAP policy, sample results are not blank corrected.

EMSL Analytical, Inc.

200 Route 130, Cinnaminson, NJ, 08077
Telephone: 856-858-4800 Fax:856-786-5974
EMSL-CIN-01

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Project Name: Woodward Tunnel Survey // 204BS07475

Customer PO:
EMSL Sales Rep: Anthony DeRosa
Received: 10/07/2024 09:00
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Owen McKenna Laboratory Manager or other approved signatory

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Analysis following EMSL SOP for the Determination of Environmental Lead by FLAA. The laboratory has a reporting limit of 0.008% by wt., based upon a minimum sample weight of 0.25g submitted to the lab, and is not responsible for any result or reporting limit provided in mg/cm2 since it is dependent upon an area value provided by non-lab personnel. A "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty and definitions of modifications are available upon request. Results in this report are not blank corrected unless specified.

EMSL ANALYTICAL, INC.
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Lead Chain of Custody

EMSL Order Number / Lab Use Only

AC 32694

EMSL Analytical, Inc.
200 Route 130 North
Cinnaminson, NJ 08077

PHONE: (800) 220-3675
EMAIL: CinnaminsonLeadLab@emsl.com

Customer Information		Billing Information	
Customer ID:		Billing ID:	
Company Name:	Atlas Technical	Company Name:	Atlas Technical
Contact Name:	Steve Hudson	Billing Contact:	Steve Hudson
Street Address:	11117 Mockingbird Drive	Street Address:	11117 Mockingbird Drive
City, State, Zip:	Omaha, NE, 68137	City, State, Zip:	Omaha, NE, 68137
Country:	USA	Country:	USA
Phone:	402-697-9747	Phone:	402-697-9747
Email(s) for Report:	steve.hudson@oneatlas.com	Email(s) for Invoice:	

Project Information

Project Name/No:	WOODWARD TUNNEL SURVEY 204B5074 75	Purchase Order:	
EMSL LIMS Project ID: (If applicable, EMSL will provide)		US State where samples collected:	State of Connecticut (CT) must select project location: ☐ Commercial (Taxable) ☐ Residential (Non-Taxable)
Sampled By Name:	ERIC BROWN	Sampled By Signature:	Eric Brown
No. of Samples in Shipment	20		

Turn-Around-Time (TAT)

☐ 3 Hour ☐ 6 Hour ☐ 24 Hour ☐ 32 Hour ☐ 48 Hour ☒ 72 Hour ☐ 96 Hour ☐ 1 Week ☐ 2 Week

Please call ahead for large projects and/or turnaround times 6 Hours or Less. *32 Hour TAT available for select tests only; samples must be submitted by 11:30am.

MATRIX	METHOD	INSTRUMENT	REPORTING LIMIT	SELECTION
CHIPS ☒ % by wt. ☐ ppm (mg/kg) ☐ mg/cm² *Reporting Limit based on a minimum 0.25g sample weight. **Not appropriate for Ceramic Tiles - XRF is recommended	SW 846-7000B	Flame Atomic Absorption	0.008% (80ppm)	☒
	SW 846-6010D*	ICP-OES	0.0004% (4ppm)	☐
AIR	NIOSH 7082	Flame Atomic Absorption	4µg/filter	☐
	NIOSH 7303M	ICP-OES	1.0µg/filter	☐
	NIOSH 7303M	ICP-MS	0.05µg/filter	☐
WIPE ☐ ASTM ☐ NON-ASTM	SW 846-7000B	Flame Atomic Absorption	10µg/wipe	☐
*If no box is checked, non-ASTM Wipe is assumed	SW 846-6010D*	ICP-OES	1.0µg/wipe	☐
TCLP	SW 846-1311 / 7000B / SM 3111B	Flame Atomic Absorption	0.4 mg/L (ppm)	☐
	SW 846-1311 / SW 846-6010D*	ICP-OES	0.1 mg/L (ppm)	☐
SPLP	SW 846-1312 / 7000B / SM 3111B	Flame Atomic Absorption	0.4 mg/L (ppm)	☐
	SW 846-1312 / SW 846-6010D*	ICP-OES	0.1 mg/L (ppm)	☐
TTLC	22 CCR App. II, 7000B	Flame Atomic Absorption	40mg/kg (ppm)	☐
	22 CCR App. II, SW 846-6010D*	ICP-OES	2mg/kg (ppm)	☐
STLC	22 CCR App. II, 7000B	Flame Atomic Absorption	0.4 mg/L (ppm)	☐
	22 CCR App. II, SW 846-6010D*	ICP-OES	0.1 mg/L (ppm)	☐
Soil	SW 846-7000B	Flame Atomic Absorption	40mg/kg (ppm)	☐
	SW 846-6010D*	ICP-OES	2mg/kg (ppm)	☐
Wastewater	SM 3111B / SW 846-7000B	Flame Atomic Absorption	0.4 mg/L (ppm)	☐
Unpreserved ☐ / Preserved with HNO3 ☐ PH<2	EPA 200.7	ICP-OES	0.020 mg/L (ppm)	☐
Drinking Water	EPA 200.5	ICP-OES	0.003 mg/L (ppm)	☐
Unpreserved ☐ / Preserved with HNO3 ☐ PH<2	EPA 200.8	ICP-MS	0.001 mg/L (ppm)	☐
TSP/SPM Filter	40 CFR Part 50	ICP-OES	12 µg/filter	☐
Other:				☐

Sample Number	Sample Location	Volume / Area	Date / Time Sampled
	SEE OTHER SHEETS		

20 EQS

Method of Shipment:		Sample Condition Upon Receipt:	
Relinquished by: Eric Brown	Date/Time: 10/4/24 17:00	Received by: EQuinn EFX	Date/Time: 10-7-24 - 9am
Relinquished by:	Date/Time:	Received by:	Date/Time

*6010C Available Upon Request

☐ AGREE TO ELECTRONIC SIGNATURE (By checking, I consent to signing this Chain of Custody document by electronic signature.)

EMSL Analytical, Inc.'s Laboratory Terms and Conditions are incorporated into this Chain of Custody by reference in their entirety. Submission of samples to EMSL Analytical, Inc. constitutes acceptance and acknowledgment of all terms and conditions by Customer.

AC32694

PAINT CHIP SAMPLE LOG SHEET

ATLAS
11117 Mockingbird Drive
Omaha, NE 68137
Phone (402) 697-9747

Project Information

Client:	Project Description: Linden C+D	Project Manager: SH Inspector: EB
Date: 10/2/24	Site Location: Woodward	ATLAS PROJECT NUMBER: 204BS07475

Sample #	Paint Color	Substrate	Sample Location	Quantity
PLLC-1	Green	Plaster	Linden C Rm 202	
PLLC-2	Orange	~~CMU~~/Brick	Rm 202	
PLLC-3	Light Blue	Brick	Rm 202	
PLLC-4	Dark Gray-Blue	metal	Rm 215	
PLLC-5	Dark Blue	metal	214	
PLLC-6	Gray	Brick	214	
PLLC-7	White	CMU	206	
PLLC-8	Tan	CMU	206	
PLLC-9	Light Green	Plaster	227	
PLLC 10	Dark Gray	Brick	229	

AC 326954

PAINT CHIP SAMPLE LOG SHEET

ATLAS

11117 Mockingbird Drive
Omaha, NE 68137

Phone (402) 697-9747

Project Information

Client:	Project Description: Linden C+D	Project Manager: SH Inspector: EB
Date: 10/2/24	Site Location: Woodward	ATLAS PROJECT NUMBER: 204BS0 7475

Sample #	Paint Color	Substrate	Sample Location	Quantity
PCLC-11	Black	Brick	135	
PCLC-12	Purple	Brick	135	

AC32694

PAINT CHIP SAMPLE LOG SHEET

ATLAS
11117 Mockingbird Drive
Omaha, NE 68137
Phone (402) 697-9747

Project Information

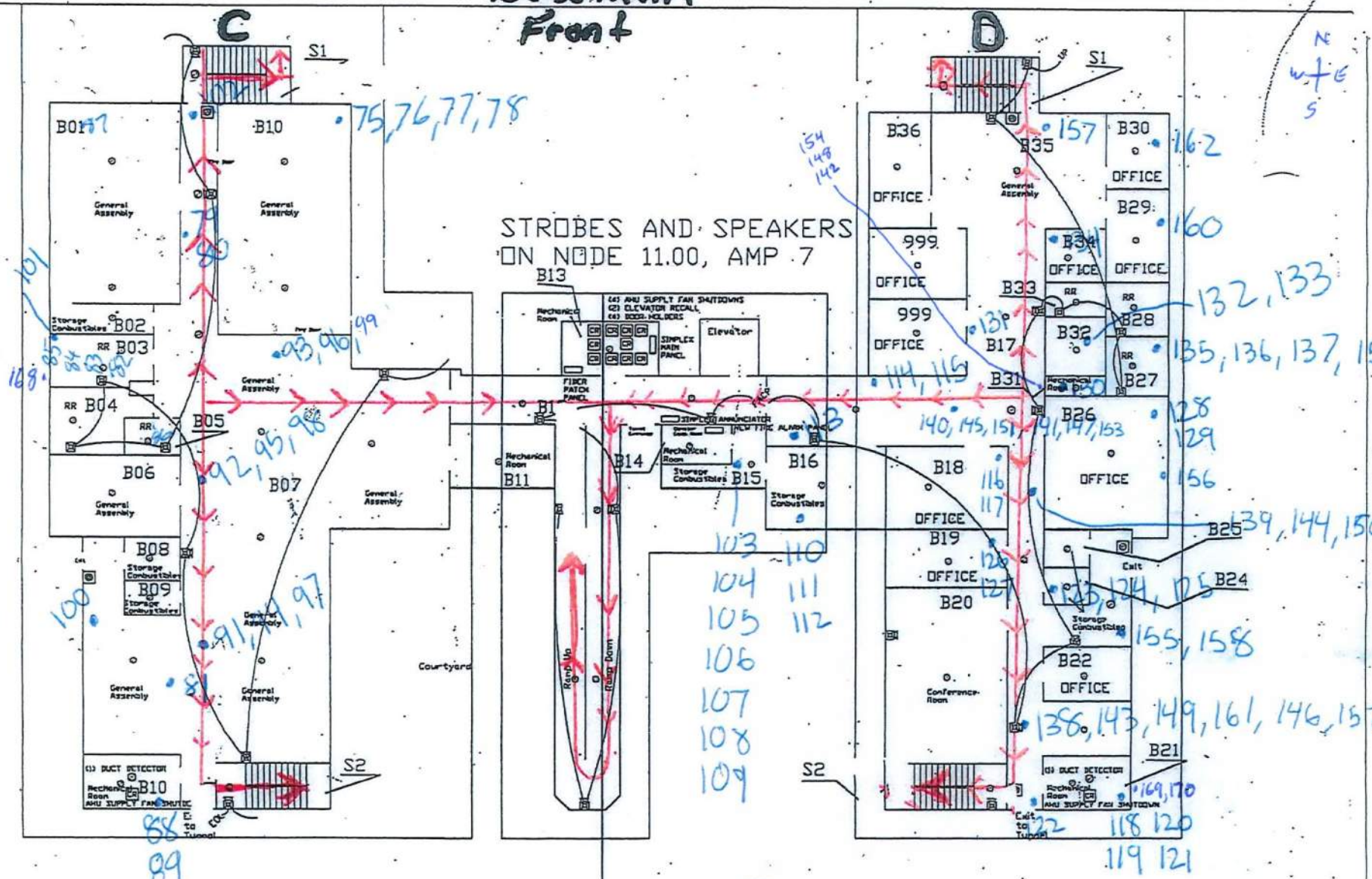
Client:	Project Description: LINDEN CID	Project Manager: SH Inspector: EB
Date: 10/3/24	Site Location: WOODWARD	ATLAS PROJECT NUMBER: 204BS07475

Sample #	Paint Color	Substrate	Sample Location	Quantity
PCLC-13	GRAYISH-BLUE	PLASTER/CONCRETE	B07	
PCLC-14	OFF-WHITE	CONCRETE	~~B05~~ B07	
PCLC-15	WHITE	CONCRETE	~~B05~~ B07	
PCLC-16	BLUE	METAL	~~B05~~ B07 HANDRAIL	
PCLC-17	BLACK	METAL	B01 HANDRAIL	
PCLC-18	LT. BLUE	CONCRETE	B01 WALL	
PCLC-19	Beige	Drywall	B17 Wall	
PCLC-20	Speckled Blue	Concrete	North Stairwell D	

APPENDIX C

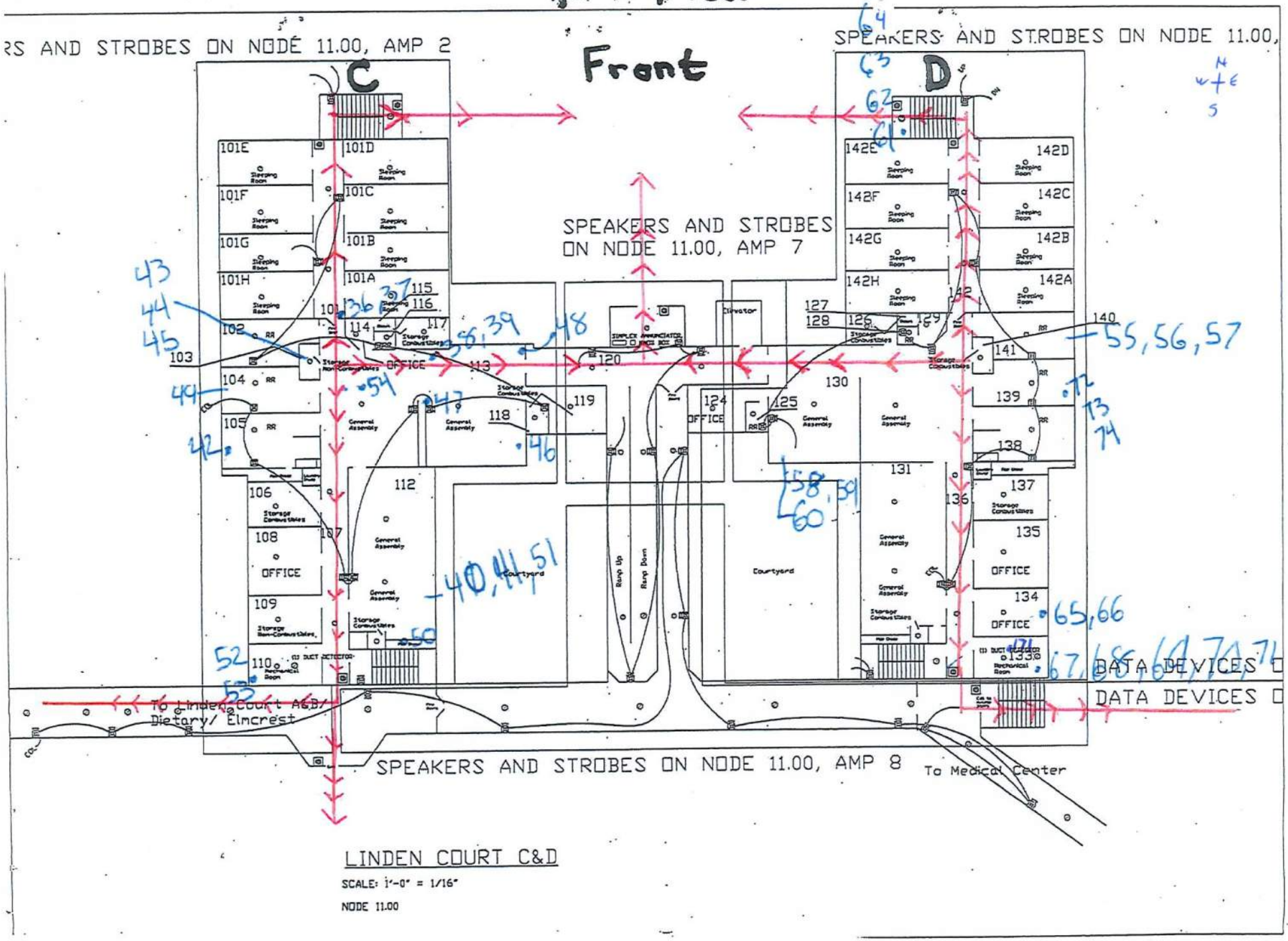
DRAWINGS WITH SAMPLE LOCATIONS

Basement
Front



LINDEN COURT C&D

1st Floor

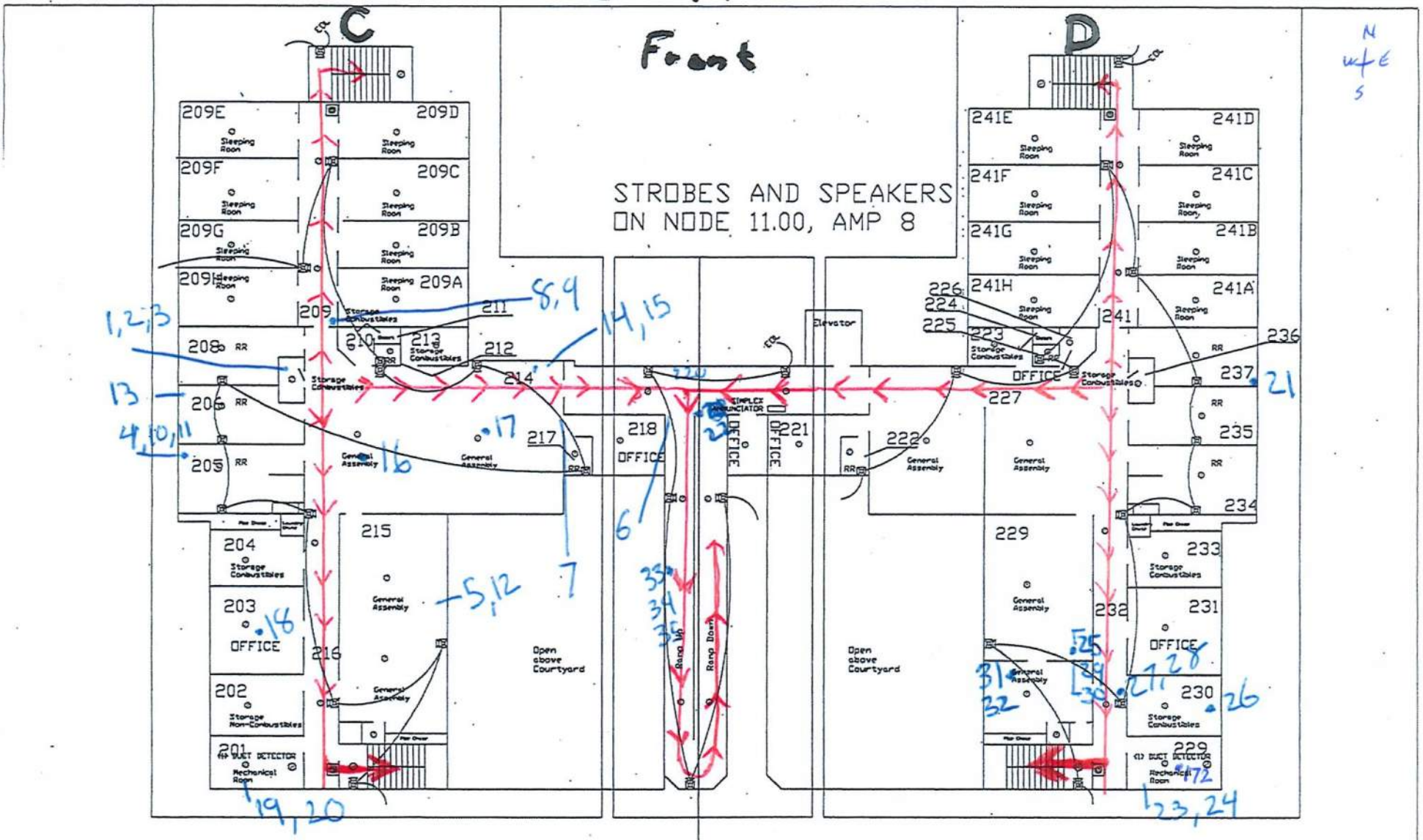


LINDEN COURT C&D

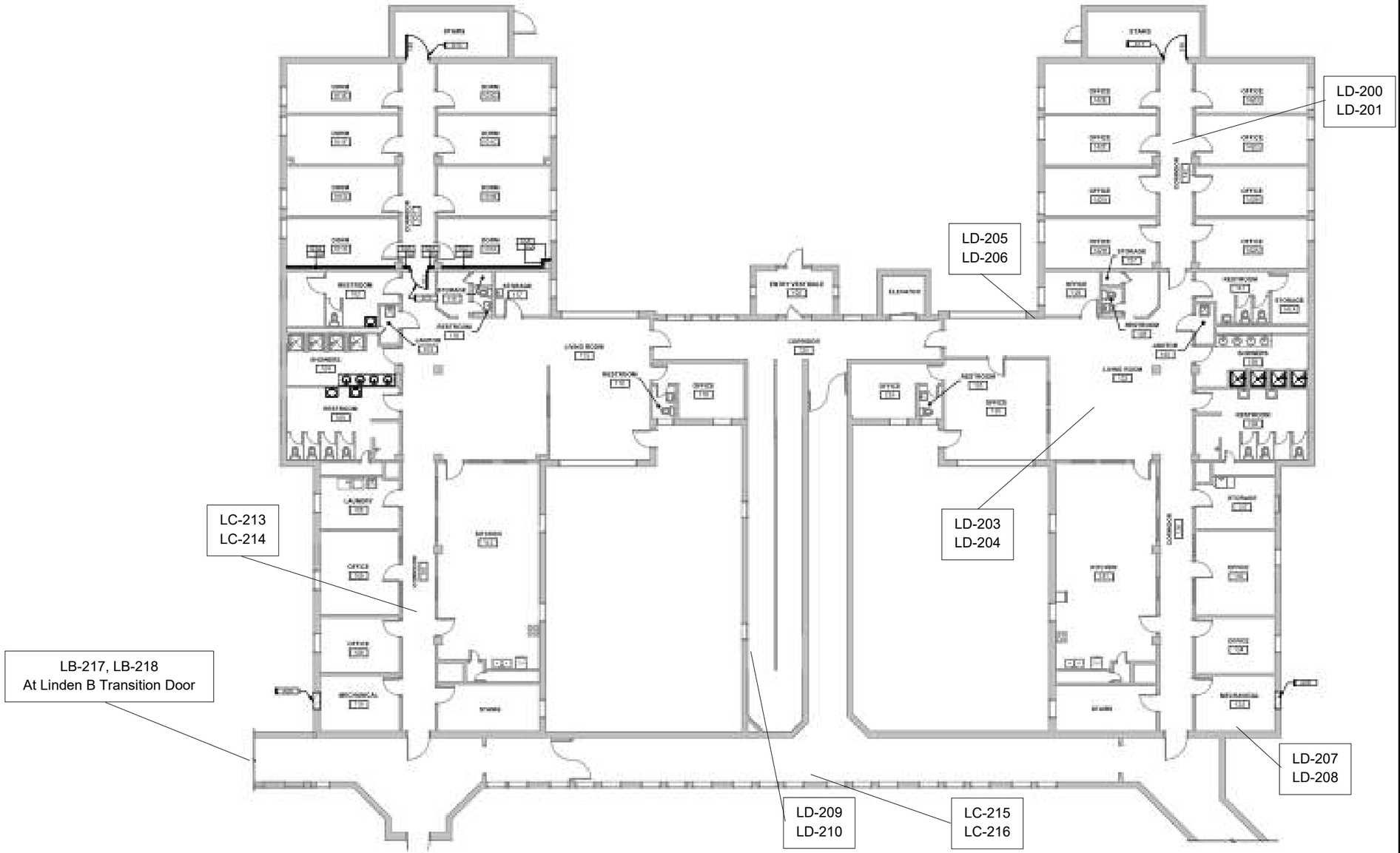
SCALE: 1'-0" = 1/16"

NODE 11.00

2nd Floor



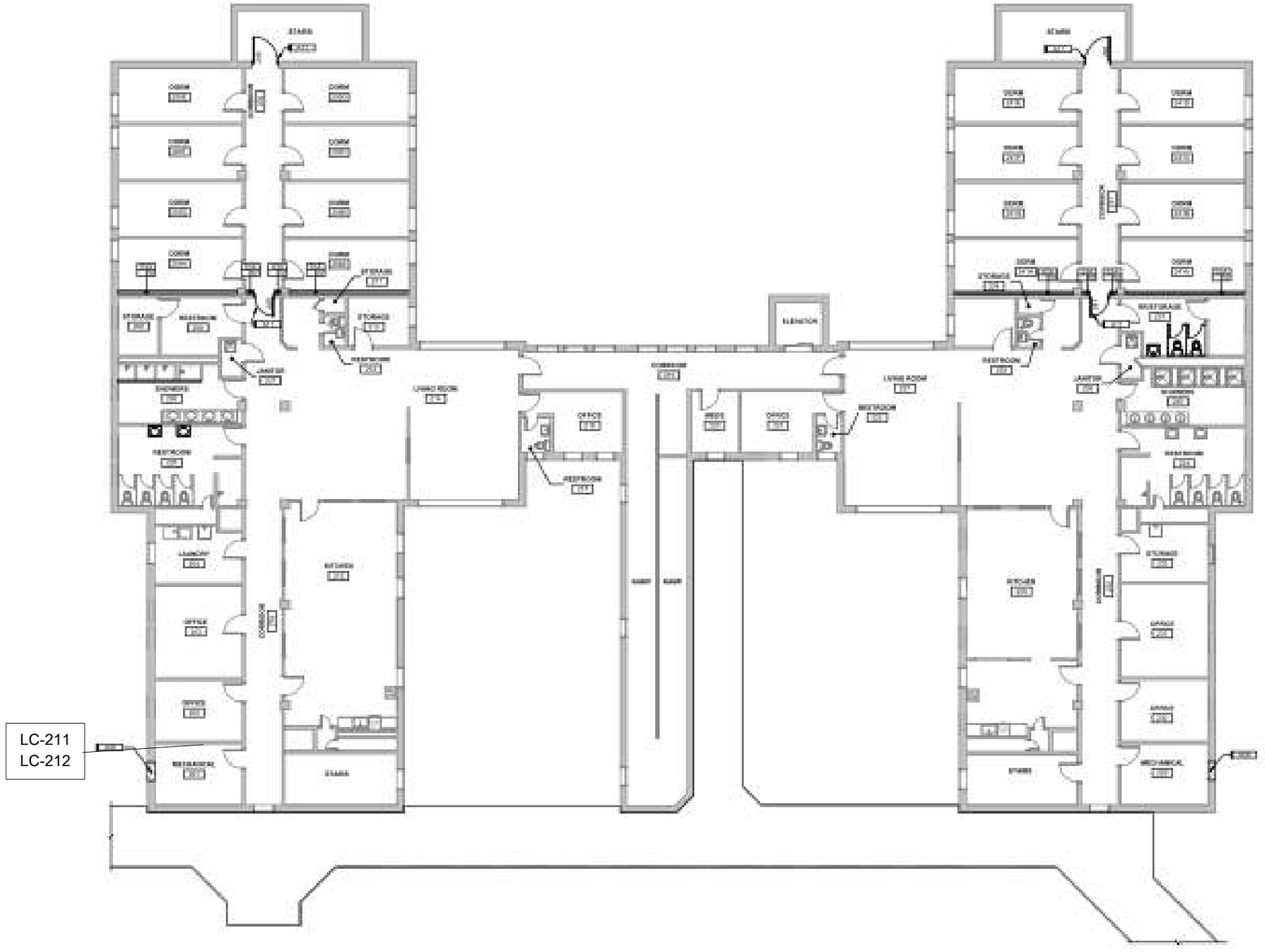
LINDEN COURT C&D



FIRST FLOOR PLAN - BUILDING C & D

XX-XX = Sample Location

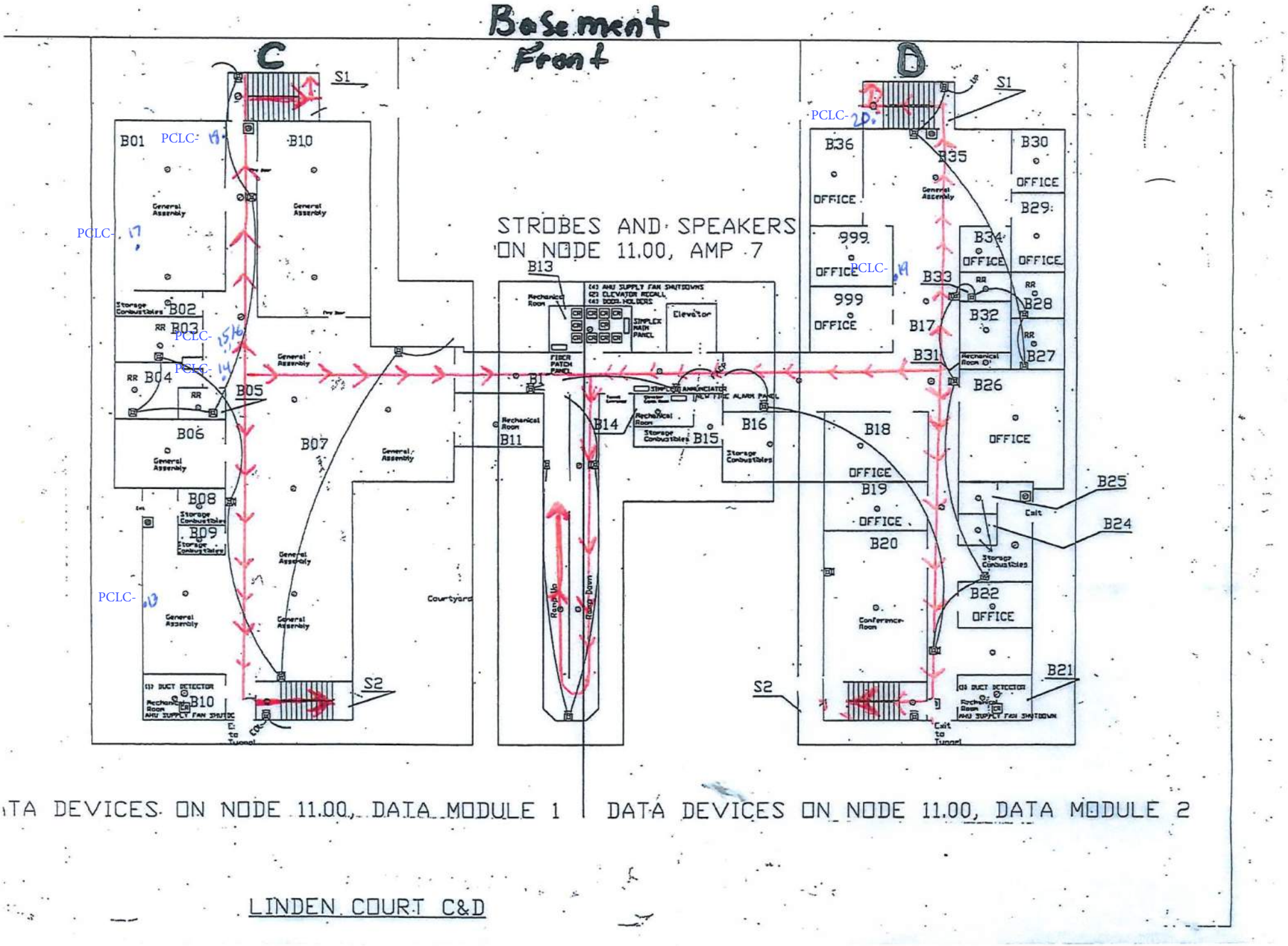
Project No. 204BS09286	Date: December 31, 2026	ATLAS 11117 Mockingbird Drive Omaha, NE 68137 PH. (402) 697-9747	**Asbestos Sample Locations** Linden Court C/D Building 1251 334th Street Woodward, IA 50276
Project Manager: Phillip Thomas			
Name: 1st Floor			



XX-XX = Sample Location

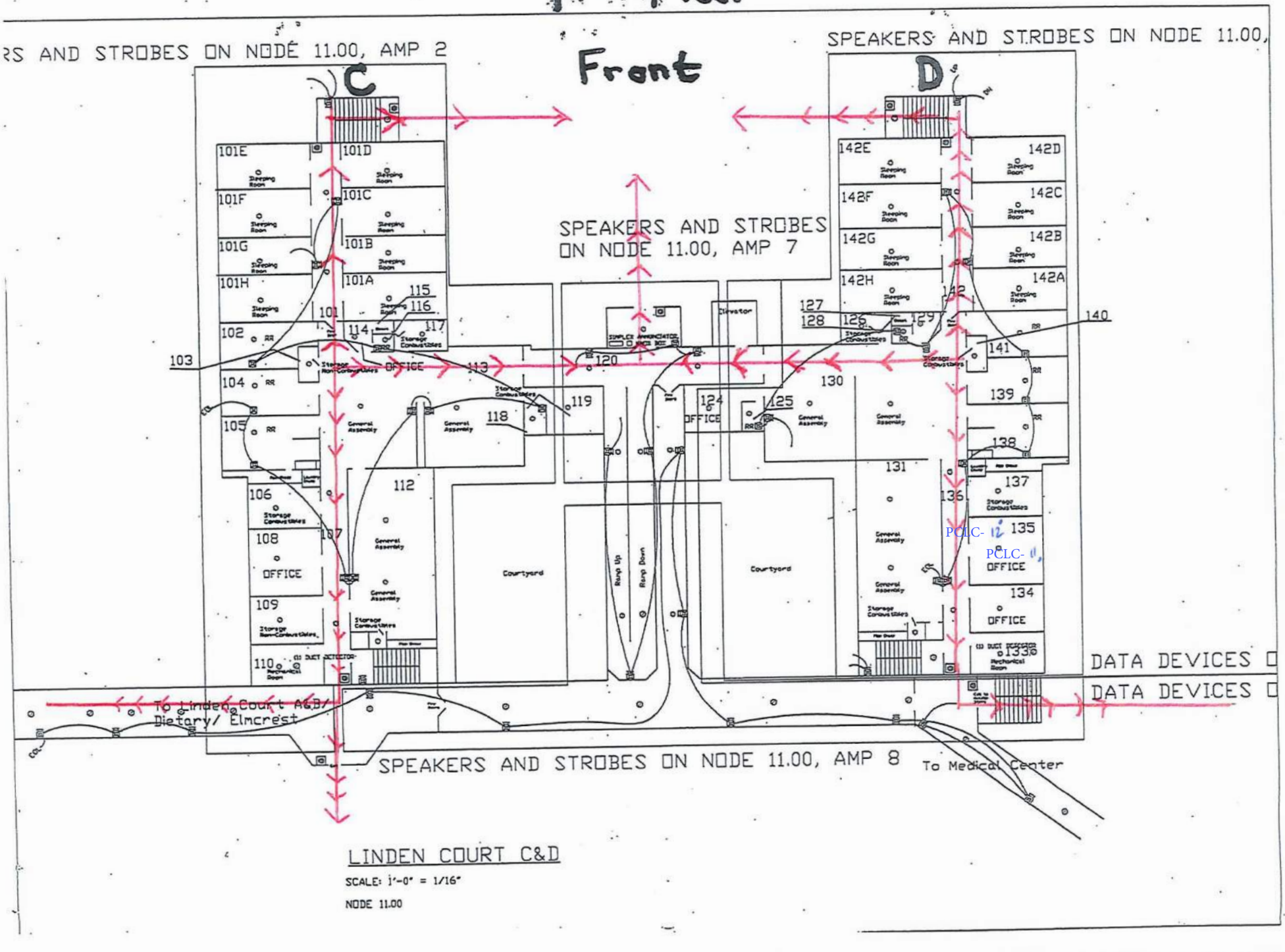
SECOND FLOOR PLAN - BUILDING C & D

Project No. 204BS09286	Date: December 31, 2025	ATLAS 11117 Mockingbird Drive Omaha, NE 68137 PH. (402) 697-9747	**Asbestos Sample Locations** Linden Court C/D Building 1251 334th Street Woodward, IA 50276
Project Manager: Phillip Thomas			
Name: 2nd Floor			



LINDEN COURT C&D

1st Floor



PCLC- 12

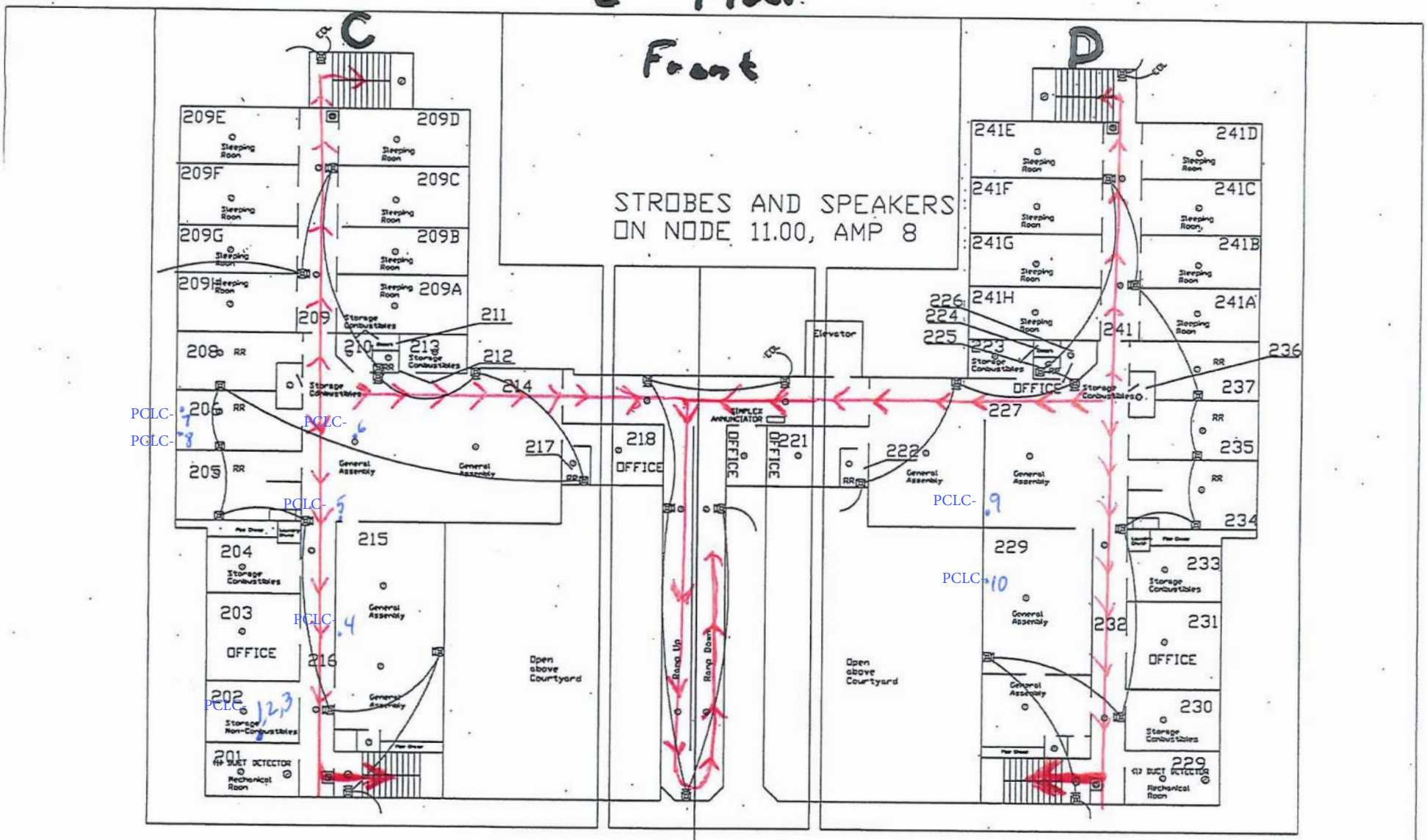
PCLC- 11

LINDEN COURT C&D

SCALE: 1'-0" = 1/16"

NODE 11.00

2nd Floor



DATA DEVICES ON NODE 11.00, DATA MODULE 1 | DATA DEVICES ON NODE 11.00, DATA MODULE 2

LINDEN COURT C&D

APPENDIX D

ASBESTOS AND LEAD PAINT PHOTO LOGS



View of the Linden C & D.

1



View of the Asbestos Containing TSI Sealant. (LC-89, 5% Chrysotile)

2

Photograph Log Linden C & D 1251 334th Street Woodward, Iowa Project No. 204BS07475	**Atlas Technical Consultants LLC** 4503 East 50th Street, Suite 800, Des Moines, IA 50317 (515) 981-4528



View of the Asbestos Containing 9” x 9” VFT & Mastic. (LC-103, 104, 105, & 106, 4% - 8% Chrysotile)	**3**



View of the Asbestos Containing Black Mastic. (LC-110, 4% Chrysotile)	**4**



View of the Asbestos Containing TSI Sealant. (LC-121, 3% Chrysotile)

5



View of the Asbestos Containing Red Sheet Flooring and Black Mastic.
(LC-123 & 124, 2% - 3% Chrysotile)

6



View of the Asbestos Containing Black Mastic. (LC-129, 3% Chrysotile)

7



View of the Asbestos Containing TSI Circulating Water Elbows.
(LC-152, 153, & 154, 45% Chrysotile)

10



View of the Asbestos Containing Window Glazing. (LC-168, 2% Chrysotile)	**11**



View of the Asbestos Containing Acoustical Texture on Ceilings. (LD-201, 204, 210, LC-214, 216) 20 – 25% Chrysotile)	**12**

Corrupt File

View of the Asbestos Containing Skim Coat associated with Plaster. 1st Floor, Corridor 161, Transition Doorway/Wall at Linden C to B. (LC-218) 20 – 25% Chrysotile)	**13**



View of Linden C & D.	1



View of the Green Lead Containing Paint. (PCLC-1, 0.75% Pb)	2

Photograph Log Linden C & D 1251 334th Street Woodward, Iowa Project No. 204BS09286	**Atlas Technical Consultants LLC** 4503 East 50th Street, Suite 800, Des Moines, IA 50317 (515) 981-4528



View of the Off-White Lead Containing Paint. (PCLC-14, 0.013% Pb)

3



View of the Beige Lead Containing Paint. (PCLC-19, 0.020% Pb)

4

Photograph Log Linden C & D 1251 334th Street Woodward, Iowa Project No. 204BS09286	**Atlas Technical Consultants LLC** 4503 East 50th Street, Suite 800, Des Moines, IA 50317 (515) 981-4528

APPENDIX E

INSPECTOR ACCREDITATIONS

ERIC BROWN

DOB: 05-07-1970

Issued: 02-27-2024



This person is licensed to perform asbestos work in the State of Iowa. ID card is intended for official use only and must be present on jobsite.

License Type	Number	Expires
INSPECTOR	24-11418	02-09-2025

IOWA

Asbestos

Larry Johnson, Jr.
Labor Commissioner

CHRISTOPHER NICOLET



DOB: 05-24-1995

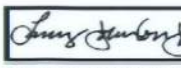
Issued: 01-15-2025

This person is licensed to perform asbestos work in the State of Iowa. ID card is intended for official use only and must be present on jobsite.

License Type	Number	Expires
INSPECTOR	25-12809	12-20-2025

IOWA

Asbestos



Larry Johnson, Jr.
Labor Commissioner

PHILLIP THOMAS

DOB: 05-26-1976

Issued: 01-15-2025



This person is licensed to perform asbestos work in the State of Iowa. ID card is intended for official use only and must be present on jobsite.

License Type	Number	Expires
INSPECTOR	25-12849	01-06-2026
PROJECT DESIGNER	25-12850	01-06-2026
MANAGEMENT PLANNER	25-12851	01-07-2026

IOWA

Asbestos

Larry Johnson, Jr.
Labor Commissioner

SECTION 00 3143

PERMIT APPLICATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Permit Application Information
B. Licenses, Permits, and Related Inspections

1.02 PERMIT APPLICATION INFORMATION

A. State Building Code Plan Review: The plan review and inspections for this project have been applied for by the Architect. Please contact your inspector prior to construction and occupancy.
B. State Building Code Energy Review: The energy code review and inspections for this project have been applied for by the Architect. Please contact your inspector prior to construction and occupancy.
C. Electrical Permit and Inspections: Trade Contractor is responsible for permits and inspections.
D. Elevator Permit and Inspections: Trade Contractor is responsible for permits and inspections.
E. Other Applicable inspections: Trade Contractor is responsible for any other applicable project specific permits and inspections.

1.03 LICENSES, PERMITS, AND RELATED INSPECTIONS

A. The Bidder shall comply with all codes, laws, ordinances, rules and regulations of any public authority having jurisdiction that bears on the performance of its work. All construction, materials and methods shall comply with the State Building Codes, except where plans and specifications establish a higher standard.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION

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SECTION 00 4116

BID FORM

The Bid Form must be submitted online through the State's IMPACS Electronic Procurement System.

RFB #927940-04

BID FORM for CONSTRUCTION CONTRACT
for
Woodward Resource Center
1251 334th Street, Woodward, Iowa 50276
Project 9279.40 & 9279.41

Iowa Department of Administrative Services
Hoover State Office Building, Level 3
1305 East Walnut Street
Des Moines, Iowa 50319-0105

The following information is to be completed and submitted with your bid.

1. Bid Form - Completed and Signed (to be uploaded with bid submission)
2. Non-Discrimination Clause Information
3. Contractor Targeted Small Business Enterprise Pre-Bid Contract Information
4. Bid Security – 5% of total Bid amount (to be uploaded with bid submission)

Authorized Representative:
The undersigned Bidder, in response to your Request for Bid for construction of the above project, having examined the Drawings, Specifications, and other Bidding Documents dated March 27, 2026 and Addenda issued and acknowledged below as received and being familiar with all the conditions surrounding the construction of the proposed project including the availability of materials and labor, hereby proposes to furnish all labor, materials, equipment and supplies to perform all work to construct the project in strict accordance with the proposed Contract Documents, within the time and at the prices stated below. Prices are to cover all expenses incurred in performing the work required under the proposed Contract Documents, of which this bid is a part.

Bidder acknowledges receipt of the following Addenda which are a part of the Bidding Documents and for which any effect on cost of the Work is included in the bid amounts indicated:

Number _____ _____ _____ _____ _____

Dated _____ _____ _____ _____ _____

Note that the State of Iowa is exempt from State and Local sales and use taxes (including local option and school option) for this project. Taxes on construction materials shall NOT be included in the bid amounts.

Amounts shall be indicated in both words and figures. In case of discrepancy, the amount indicated in words shall govern.

BID PACKAGES:

BP 01-1

Description: Abatement

Bidder proposes and agrees to perform all work as described in the Construction Documents for the sum of:

_____

_____ Dollars

($_____).

BP 09-1

Description: General Construction

Bidder proposes and agrees to perform all work as described in the Construction Documents for the sum of:

Decentralization General Construction (9279.40)

_____

_____ Dollars

($_____).

Fire Suppression General Construction (9279.41)

_____

_____ Dollars

($_____).

Total for Decentralization and Fire Suppression General Construction (9279.40 + 9279.41)

_____

_____ Dollars

($_____).

BP 21-1

Description: Fire Suppression

Bidder proposes and agrees to perform all work as described in the Construction Documents for the sum of:

_____

_____ Dollars

($_____).

BP 23-1

Description: Decentralization Mechanical

Bidder proposes and agrees to perform all work as described in the Construction Documents for the sum of:

_____

_____ Dollars

($_____).

BP 26-1

Description: Decentralization Electrical & Fire Alarm & Elevator Modifications

Bidder proposes and agrees to perform all work as described in the Construction Documents for the sum of:

Decentralization Electrical & Fire Alarm (9279.40)

_____

_____ Dollars

($_____).

Elevator Modifications (9279.41)

_____

_____ Dollars

($_____).

Total for Decentralization Electrical & Fire Alarm & Elevator Modifications (9279.40 + 9279.41)

_____

_____ Dollars

($_____).

UNIT PRICES:

BP 01-1 UNIT 01

Description: Floor Tile and Mastic

_____

_____ Dollars

($_____).

BP 01-1 UNIT 02

Description: Window Glazing

_____

_____ Dollars

($_____).

BP 01-1 UNIT 03

Description: Additional Electrical Box Installation

_____

_____ Dollars

($_____).

BP 26-1 UNIT 01

Description: Smoke Detector

_____

_____ Dollars

($_____).

BP 26-1 UNIT 02

Description: Heat Detector

_____

_____ Dollars

($_____).

BP 26-1 UNIT 03

Description: Duct Smoke Detector

_____

_____ Dollars

($_____).

BP 26-1 UNIT 04

Description: Fire Alarm Relay

_____

_____ Dollars

($_____).

BP 26-1 UNIT 05

Description: Ceiling Mounted Speaker Strobe

_____

_____ Dollars

($_____).

BP 26-1 UNIT 06

Description: Wall Mounted Speaker Strobe

_____

_____ Dollars

($_____).

BP 26-1 UNIT 07

Description: Ceiling Mounted Strobe

_____

_____ Dollars

($_____).

BP 26-1 UNIT 08

Description: Wall Mounted Strobe

_____

_____ Dollars

($_____).

Bidder hereby certifies that:

1. This bid is genuine and is not made in the interest of or on behalf of any undisclosed person, firm or corporation;
2. Bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid; Bidder has not solicited or induced any person, firm or corporation to refrain from bidding; and Bidder has not sought by collusion to obtain any advantage over any other bidder or over the Owner.
3. Bidder hereby certifies that the Bidder is registered with the Iowa Labor Commissioner as a Contractor as required by Chapter 91C, Code of Iowa.
4. Bidder agrees to comply with all Federal and State Affirmative Action/Equal Employment Opportunity requirements concerning fair employment and will not discriminate between or among them by reason of race, color, religion, sex, national origin or physical handicap.
5. All construction under this Contract shall conform to the requirements of the *Iowa State Building Code*.
6. Bidder agrees that this bid shall remain valid and shall not be withdrawn for a period of thirty (30) calendar days after the date for receipt of bids.
7. Bidder agrees that if written notice of acceptance of this bid is mailed, emailed, or delivered to the undersigned within thirty (30) days after the date in which bids are due, or at any time thereafter before it is withdrawn, the undersigned will sign and return the Contract Agreement, prepared in accord with the Bidding Documents and this bid as accepted; and will also provide proof of insurance coverage and required surety bonds.
8. Bidder understands that the Owner reserves the right to reject any and all bids, and to waive irregularities or informalities and enter into a contract for the work, as the Owner deems to be in the best interest of the State.
9. Bidder understands that the Owner reserves the right to accept any, or no, Alternate Bid, if requested, and that the Alternate Bids may be considered in any order or combination, and the low Bidder shall be determined on the basis of the sum of the base bid and any Alternate(s) accepted.

Subcontractors:
The Trade Contractor must identify all Subcontractors and Suppliers within 48 hours of the published date and time for which bids must be submitted, in accordance with Iowa Code Section 8A311, as amended by House File 646 in 2011. Subcontractors and suppliers may not be changed without the approval of the Owner. Requests for changing a Subcontractor or supplier must identify the reason for the proposed change, the name of the new Subcontractor or supplier, and the change in the subcontractor or supplier price as a result of the change. Any reduction in subcontractor or supplier price as a result of the change, if the change is approved by the Owner, shall be deducted from the Trade Contract Price via a deductive Change Order. Any such changes, if approved by the Owner, which result in an increase in the Trade Contract Price shall be borne by the Trade Contractor.

Enforcement of Reciprocal Resident Bidder Preference, per Iowa Code 73A.21.

All bidders shall either check the box next to “Resident Bidder” or check the box next to “Nonresident Bidder” and by doing so and signing thereafter certifies and attests to the same. All information requested must be provided. Seek out the advice of an attorney if you have questions.

“Resident Bidder” means a person or entity authorized to transact business in of the State of Iowa and having a place of business for transacting business within the State of Iowa 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. Note, however, that if a nonresident bidder’s 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.

☐ Resident Bidder

Name of Resident Bidder: _____

By: _____
Authorized Agent and Signatory of Resident Bidder

OR:

☐ Nonresident Bidder

Name of Nonresident Bidder: _____

Name of State or Foreign Country of Nonresident Bidder: _____

Particularly identify and describe any preference, labor preference, or any other type of preferential treatment, in effect in the nonresident bidder's state or foreign country at the time of this bid:

_____
_____
_____

NOTICE: Nonresident Bidders domiciled in a state or country with a resident labor force preference shall make and keep, for a period of not less than three years, accurate records of all workers employed on the public improvement. The records shall include each worker's name, address, telephone number when available, social security number, trade classification, and the starting ending time of employment.

By: _____
Authorized Agent and Signatory of Nonresident Bidder

REQUIRED: Bid Form shall be signed by an officer of the company with authority to bind in a contract. Notice of acceptance of this bid, or request for additional information by the Department of Administrative Services, may be addressed to the undersigned at the address set forth below:

Legal Name of Firm: _____

Date: _____

Signature of Bidder: _____

Title: _____

Typed Name of Signatory: _____

Email: _____

Business Address:

_____
_____
_____

Telephone Number: _____ Fax Number: _____

Federal Tax Identification Number: _____

Iowa Contractor Registration Number: _____

Bidder Safety Manager Name:_____

For an out-of-state Bidder, Bidder certifies that the Resident Preference given by the State or Foreign Country of Bidder's residence, _____, is _____ %.

END OF SECTION

SECTION 00 4116.01

NON-DISCRIMINATION CLAUSE

This Section is for informational purposes only. All information will be submitted online through the State's IMPACS Electronic Procurement System.

PART 1 - GENERAL

All contractors, subcontractors, vendors and suppliers of goods and services doing business with the State of Iowa and value of said business equals or exceeds $10,000 annually, agree as stated below.

1.01 NONDISCRIMINATION CLAUSE

A. The contractor, subcontractor, vendor and supplier of goods and services will not discriminate against an employee or applicant for employment because of race, creed, color, sex, national origin, ancestry, religion, economic status, age, disability, political opinion, or affiliations of an applicant or employee based upon the nature of the job occupation. The contractor, subcontractor, vendor and supplier will develop an Affirmative Action Program to insure that applicants are employed and that employees are treated during employment without regard to their race, creed, color, sex, national origin, ancestry, religion, economic status, age, disability, political opinions or affiliations. Such action shall include, but not be limited to the following:
   1. Employment.
   2. Upgrading.
   3. Demotion or transfer.
   4. Recruitment and advertising.
   5. Layoff or termination.
   6. Rates of pay or other forms of compensation.
   7. Selection for training, including apprenticeship.

B. The contractor, subcontractor, vendor and supplier of goods and services will, in all solicitations or advertisements for employees, state that all qualified applicants will receive consideration for employment without regard to race, creed, color, sex, national origin, ancestry, religion, economic status, age, disability, political opinion or affiliations.

C. The contractor, subcontractor, vendor and supplier or their collective bargaining representative will send to each labor union or representative or workers with which they have a collective bargaining agreement or other contract or understanding, a notice advising the said labor union or workers' representative of the contractor's commitments under this section.

D. The contractor, subcontractor, vendor and supplier of goods and services will comply with all published rules, regulations, directives and orders of the State of Iowa Affirmative Action Program Contract Compliance Provisions.

E. The contractor, subcontractor, vendor and supplier of goods and services will furnish and file compliance reports within such time and upon such forms as provided by the Equal Employment Opportunity Officer, said forms may elicit information as to the policies, procedures, patterns, and practices of each subcontractor as state as the contractor themselves and said contractor, subcontractor, vendor and supplier will permit access to their employment books, records and accounts to the State's Equal Employment Opportunity Officer, for the purpose of investigation to ascertain compliance with this Contract and with rules regulations of the State's Affirmative Action Program.

F. In the event of the contractor's noncompliance with the nondiscrimination clauses of this Contract or with any of such rules, regulations and orders; this Contract may be canceled, terminated or suspended in whole or in part and the Contractor may be declared ineligible for further contracts in accordance with procedures authorized by the State of Iowa.

G. The contractor, subcontractor, vendor and supplier of goods and services will include, or incorporate by reference, the provisions of the nondiscrimination clause in every contract, subcontract or purchase order unless exempted by the rules, regulations or orders of the State's Affirmative Action Program, and will provide in every subcontract or purchase order that said provisions will be binding upon each contractor, subcontractor or seller.

H. The parties agree to comply with "Compliance with the Law; Nondiscrimination in Employment" of the current Terms and Conditions at the award of this contract. Current Terms and Conditions may be found on the following web site and are, by this reference, made a part of this Agreement. https://das.iowa.gov/procurement/terms-and-conditions

I. We certify and recognize that we are morally and legally committed to nondiscrimination in employment. Any person who applies for employment with our company will not be discriminated against because of race, creed, color, sex, national origin, ancestry, religion, economic status, age or disabilities, unless disabilities are based upon the nature of the job occupation.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION

SECTION 00 4116.02

TARGETED SMALL BUSINESS INFORMATION

This Section is for informational purposes only. All information will be submitted online through the State's IMPACS Electronic Procurement System.

PART 1 - GENERAL

1.01 TARGETED SMALL BUSINESS INFORMATION

A. Subcontractor Targeted Small Business Enterprise Pre-Bid Contact Information, including subcontractor and dollar amount to be subcontracted, is to accompany the Bid submission. Bidders shall comply with all affirmative action/equal opportunity provisions of State and Federal laws. The Owner seeks to provide opportunities for Targeted Small Businesses in accordance with the provisions of Chapter 73 of the Code of Iowa.

B. Search the Targeted Small Business Directory for certified State of Iowa Targeted Small Businesses.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION

IOWA DEPARTMENT OF ADMINISTRATIVE SERVICES
SUBCONTRACTOR
TARGETED SMALL BUSINESS ENTERPRISE
PRE-BID CONTRACT INFORMATION

CONTRACTOR	**BID NO.**	**PAGE #**

(to be completed by bidder)

You are requested to provide the information on this form showing your targeted Small Business enterprises contacts made prior to your bid submission. This information is subject to verification and confirmation. NOTE: The Department of General Services will not regard your acceptance or use of a low quote or bid from a non-targeted Small Business Enterprise on any subcontract item as evidence itself of any lack of good faith effort to solicit targeted Small Business Enterprise subcontractors on this project. However, every effort shall be made to solicit quotes or bids on as many subcontractable items as necessary to evidence affirmative action in contracting.

TABLE OF INFORMATION SHOWING BIDDER'S PRE-BID TARGETED SMALL BUSINESS ENTERPRISE CONTACTS

SUBCONTRACTOR	TSB	DATES CONTACTED	QUOTES RECEIVED		QUOTATION USED IN BID	
			YES/NO	DATES	YES/NO	DOLLAR AMOUNT PROPOSED TO BE SUBCONTRACTED

Total dollar amount proposed to be subcontracted to TSB on this project $ _____

List items to be subcontracted. *(If more space is needed, use reverse side.)*

SECTION 00 4313

BID SECURITY FORMS

PART 1 - GENERAL

1.01 BID SECURITY FORMS

A. A Bid Bond form will be required on this project. An amended ConsensusDocs 262 is attached for reference following this page. ConsensusDocs bid bond form is not required (other standard forms are acceptable to the State of Iowa).

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION



CONSENSUSDOCS 262

BID BOND

(AMENDED BY STATE OF IOWA)

This document was developed through a collaborative effort of organizations representing a wide cross-section of the design and construction industry. The organizations endorsing this document believe it represents a fair allocation of risk and responsibilities for all project participants.

Endorsing organizations recognize that this document must be reviewed and adapted to meet specific needs and applicable laws. This document has important legal and insurance consequences. You are encouraged to consult legal, insurance and surety advisors before completing or modifying this document. The software includes a notes section indicating where information is to be inserted to complete this document. Further information and endorsing organizations' perspectives are available at www.consensusdocs.org/guidebook.

For Use with ConsensusDOCS 200, Standard Form of Agreement and General Conditions Between Owner and Constructor (Where the Contract Price is a Lump Sum) and ConsensusDOCS 500, Standard Agreement and General Conditions Between Owner and Construction Manager.

The Trade Contractor, _____ (the "Trade Contractor") has submitted a Bid to the Owner, _____, (the "Owner") for the _____ (the "Project") in accordance with the Bidding Documents, including Drawings and Specifications prepared by _____ (the "Design Professional").

IMPORTANT: A vertical line in the margin indicates a change has been made to the original text. Prior to signing, recipients may wish to request from the party producing the document a "redlined" version indicating changes to the original text. Consultation with legal and insurance counsel and careful review of the entire document are strongly encouraged.
ConsensusDOCS 262 • BID BOND Copyright © 2007, Revised 2009 and 2011, ConsensusDOCS LLC. AN INDIVIDUAL PURCHASE OF THIS DOCUMENT PERMITS THE USER TO PRINT ONE CONTRACT FOR ONE PROJECT ONLY. YOU MAY ONLY MAKE COPIES OF A COMPLETED DOCUMENT FOR DISTRIBUTION TO PARTIES IN DIRECT CONNECTION WITH THE SPECIFIC CONSTRUCTION PROJECT. ANY OTHER USES, INCLUDING COPYING THE DOCUMENT, ARE STRICTLY PROHIBITED.

By virtue of this Bid Bond (the "Bond"), the Constructor as Principal and _____ as Surety ("Surety"), are bound to the Owner as Obligee in the maximum amount _____, Dollars ($_____) (the "Bond Sum"). The Constructor and Surety hereby bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein.

1. If the Obligee shall accept the bid of the Constructor, the Constructor shall enter into an Agreement with the Obligee in accordance with the terms of such Bid.

2. Constructor shall procure such bond or bonds as are specified in the Contract Documents for the faithful performance of the Work and for the prompt payment of labor and materials furnished in the performance of the Work.

3. If the Constructor fails to enter such Agreement and give such bonds, the Constructor shall pay to the Obligee the difference between the amount of Constructor's bid and the amount of such agreement the Obligee in good faith executes with another Party to perform the Work covered by Constructor's Bid, not to exceed the Bond Sum stated above.

4. If the Constructor shall fulfill its obligation under Articles 1 through 3, then this obligation shall be null and void; otherwise it shall remain in full force and effect.

This Bond is entered into as of _____ (date)

SURETY: _____ (seal)

BY: .....

Print Name: _____

Print Title: _____ (Attach Power of Attorney)

Witness: .....

(Additional signatures, if any, appear on attached page)

Constructor: _____ (seal)

BY: .....

Print Name: _____

Print Title: _____

Witness: .....

(Additional signatures, if any, appear on attached page)

IMPORTANT: A vertical line in the margin indicates a change has been made to the original text. Prior to signing, recipients may wish to request from the party producing the document a "redlined" version indicating changes to the original text. Consultation with legal and insurance counsel and careful review of the entire document are strongly encouraged.
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SECTION 00 5200

AGREEMENT FORM

PART 1 - GENERAL

1.01 AGREEMENT FORM

A. The Form of Agreement to be used on this project is a modified ConsensusDocs 802. A sample is attached following this page.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION

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ConsensusDocs 802

STANDARD FORM OF AGREEMENT BETWEEN OWNER AND TRADE CONTRACTOR

(Where the Construction Manager Is the Owner's Agent)



TABLE OF ARTICLES

1. AGREEMENT
2. GENERAL PROVISIONS
3. TRADE CONTRACTOR'S OBLIGATIONS
4. OWNER'S RESPONSIBILITIES
5. SUBCONTRACTS
6. TRADE CONTRACT TIME
7. TRADE CONTRACT PRICE
8. CHANGES
9. PAYMENT
10. INDEMNITY, INSURANCE, WAIVERS AND BONDS
11. SUSPENSION, NOTICE TO CURE AND TERMINATION OF AGREEMENT
12. DISPUTE MITIGATION AND RESOLUTION
13. MISCELLANEOUS PROVISIONS
14. TRADE CONTRACT DOCUMENTS

This Agreement has important legal and insurance consequences. Consultations with an attorney and with insurance and surety consultants are encouraged with respect to its completion or modification. Notes indicate where information is to be inserted to complete this Agreement.

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ARTICLE 1 AGREEMENT

This Trade Contractor Agreement is made effective as of the xx day of Month, Year , by and between the

OWNER

State of Iowa - DAS, Department of Administrative Services ("DAS"). DAS's principal office is located: 109 SE 13th Street, Des Moines, IA 50319-0120.

and the

TRADE CONTRACTOR
Contractor Name
Address
City, State, Zip

for work in connection with the following

PROJECT
XXXX.XX - Project Name

The CONSTRUCTION MANAGER is
Construction Manager Name
Address
City, State, Zip

The DESIGN PROFESSIONAL for the Project is
Designer Name
Address
City, State, Zip

Notice to the Parties shall be given at the above addresses.

ARTICLE 2 GENERAL PROVISIONS

2.1 RELATIONSHIP OF PARTIES The Owner and the Trade Contractor agree to proceed with this Agreement on the basis of mutual trust, good faith and fair dealing and shall cooperate with each other and with the Construction Manager and Design Professional in furthering the Owner's interests. The Trade Contractor shall use its diligent efforts to perform the work in an expeditious manner consistent with the Trade Contract Documents. The Owner and the Trade Contractor will endeavor to promote harmony and cooperation among all Project participants.

2.1.1 The Owner and the Trade Contractor shall perform their obligations with integrity, ensuring at a minimum that

2.1.1.1 conflicts of interest shall be avoided or disclosed promptly to the other Party; and

2.1.1.2 the Trade Contractor and the Owner warrant that they have not and shall not pay nor receive any contingent fees or gratuities to or from the other Party, including its agents, officers and employees, Subcontractors or others for whom they may be liable, to secure preferential

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treatment.

2.2 PROJECT ORGANIZATION This Agreement is for the performance of work described herein in connection with the construction of the Project. The Owner also may enter into separate agreements with other trade contractors for other portions of the Project. The Owner has entered or will enter into a Construction Management Agreement with the Construction Manager, and a design agreement with the Design Professional.

2.3 INDEPENDENT CONTRACTOR The Trade Contractor represents that it is an independent contractor and that its performance of the Trade Contract Work it shall act as an independent contractor. Neither Trade Contractor nor any of its agents or employees shall act on behalf of the Owner except as provided in this Agreement or unless authorized in writing by the Owner.

2.4 CONSTRUCTION MANAGER IS OWNER'S AGENT The Construction Manager will represent the Owner as its agent in the administration and management of this Agreement. Any instructions, reviews, approvals, orders or directions given to the Trade Contractor by the Construction Manager will be given on behalf of and as agent for the Owner. The Trade Contractor shall be obligated to respond or perform as if the same were given directly by the Owner. The Trade Contractor shall communicate and provide all requests and concerns regarding the Trade Contract Work to the Construction Manager. The Trade Contractor shall provide copies to the Construction Manager of all notices to the Owner required by and regarding this Agreement.

2.5 CONSTRUCTION MANAGER NOT IN PRIVITY WITH TRADE CONTRACTOR This Agreement shall not give the Trade Contractor any claim or right of action against the Construction Manager. The Trade Contractor and its subcontractors shall not be beneficiaries of any obligations of the Construction Manager. This Agreement shall not create a contractual relationship between any parties except the Owner and the Trade Contractor.

2.5A NO THIRD-PARTY BENEFICIARY There are no third-party beneficiaries of this Agreement.

2.6 DESIGN PROFESSIONAL The Owner, through its Design Professional, shall provide all architectural and engineering design services necessary for the completion of the Work, except the following:

No exceptions

The Trade Contractor shall not be required to provide professional services which constitute the practice of architecture or engineering except as otherwise provided in section 3.15.

2.6.1 The Owner shall obtain from the Design Professional either a license for Trade Contractor and Subcontractors to use the design documents prepared by the Design Professional or ownership of the copyrights for such design documents, and shall defend, indemnify and hold harmless the Trade Contractor against any suits or claims of infringement of any copyrights or licenses arising out of the use of the design documents. To the extent portions of this paragraph are in conflict with SF 396 (codified at Iowa Code Section 537A.5) said portions are void and unenforceable.

2.7 EXTENT OF AGREEMENT This Agreement is solely for the benefit of the Parties, represents the entire integrated agreement between the Parties, and supersedes all prior negotiations, representations and agreements, either written or oral. This Agreement and each and every provision is for the exclusive benefit of the Owner and the Trade Contractor and not for the benefit of any third party except to the extent expressly provided in this Agreement. In the event of conflict between this Agreement and any of the Exhibits or any other documents incorporated into this Agreement, the terms and provisions of this Agreement shall control.

2.8 DEFINITIONS

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2.8.1 Agreement means this ConsensusDocs 802 Standard Form of Agreement Between Owner and Trade Contractor (Where the Construction Manager is the Owner's Agent), as modified by the Parties, and Exhibits and Attachments made part of this Agreement upon its execution.

2.8.2 Design Professional means the Architect, Design Professional or Engineer identified in ARTICLE 1 and its consultants, retained by Owner to perform design services for the Project, and licensed in the State in which the Project is located. The use of the term Design Professional in this Agreement is for convenience and is not intended to imply or infer that the individual or entity named in ARTICLE 1 will provide design professional services in a discipline in which it is not licensed.

2.8.3 Construction Manager means the Construction Manager identified in ARTICLE 1 and its authorized representative.

2.8.4 The Construction Schedule is the document initially prepared by and updated by the Construction Manager and approved by the Owner that indicates proposed activity sequences, durations, or milestone dates for such activities as receipt and approval of pertinent information, issuance of the Construction Documents, the preparation and processing of shop drawings and samples, delivery of materials or equipment requiring long-lead-time procurement, Owner's occupancy requirements and estimated dates of Substantial Completion and Final Completion of the Project.

2.8.5 The term Day shall mean calendar day unless otherwise specifically defined.

2.8.6 Final Completion occurs on the date when the Trade Contractor's obligations under this Agreement are complete and accepted by the Owner and final payment becomes due and payable, as established in ARTICLE 6. This date shall be confirmed by a Certificate of Final Completion signed by the Owner and the Trade Contractor.

2.8.7 A Hazardous Material is any substance or material identified now or in the future as toxic or hazardous under any federal, state or local law or regulation, or any other substance or material which may be considered hazardous or otherwise subject to statutory or regulatory requirements governing handling, disposal or clean-up.

2.8.8 A Material Supplier is a person or entity retained by the Trade Contractor to provide material or equipment for the Trade Contract Work. This definition is not intended to, and shall not be interpreted to, expand or modify the definition(s) of materials or material suppliers contained in Iowa Code Chapter 573.

2.8.9 Others means other contractors, material suppliers, and persons at the Worksite who are not employed by the Trade Contractor or Subcontractors.

2.8.10 The term Overhead shall mean a) payroll costs and other compensation of Trade Contractor employees in the Trade Contractor's principal and branch offices; b) general and administrative expenses of the Trade Contractor's principal and branch offices including deductibles paid on any insurance policy and c) the Trade Contractor's capital expenses, including interest on capital used for the Work.

2.8.11 Owner is the person or entity identified in ARTICLE 1 as Owner, and includes the Owner's representative.

2.8.12 The Project, as identified in ARTICLE 1, is the building, facility or other improvements for which the Trade Contractor is to perform the Trade Contract Work.

2.8.13 A Subcontractor is a person or entity retained by the Trade Contractor as an independent contractor to provide the labor, materials, equipment or services necessary to complete a specific

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portion of the Work. This definition is not intended to, and shall not be interpreted to, expand or modify the definition(s) of materials or material suppliers contained in Iowa Code Chapter 573.

2.8.14 2.8.14 Per Iowa Code Section 26.13, "substantially completed" means the first date on which any of the following occurs:(1) Completion of the Project (or Trade Contract Work, in the case of the multiple Trade Contractors) or when the Project (or Trade Contract Work in the case of multiple Trade Contractors) has been substantially completed in general accordance with the terms and provisions of the contract. (2) The work on the Project (or Trade Contract Work in the case of multiple Trade Contractors) or on the designated portion is substantially completed in general accordance with the terms of the contract so that the State Iowa can occupy or utilize the Project or designated portion of the Project for its intended purpose. 3) The Project (or Trade Contract Work in the case of multiple Trade Contractors) is certified as having been substantially completed by either of the following: (a) the architect or engineer authorized to make such certification (which is defined in this Agreement as the Design Professional). (b) The authorized contract representative (which is defined in this Agreement as the Owner's Representative). (4) The State of Iowa is occupying or utilizing the Project (or Trade Contract Work in the case of multiple Trade Contractors) for its intended purpose. This subparagraph shall not apply to highway, bridge, or culvert projects.

2.8.15 Terrorism means a violent act, or an act that is dangerous to human life, property or infrastructure, that is committed by an individual or individuals and that appears to be part of an effort to coerce a civilian population or to influence the policy or affect the conduct of any government by coercion. Terrorism includes, but is not limited to, any act certified by the United States government as an act of terrorism pursuant to the Terrorism Risk Insurance Act, as amended.

2.8.16 A Trade Contract Change Order is a written order signed by the Owner and the Trade Contractor after execution of this Agreement, indicating changes in the scope of the Trade Contract Work, the Trade Contract Price or Trade Contract Time, including substitutions proposed by the Trade Contractor and accepted by the Owner. Trade Contract Change Orders shall be executed using the ConsensusDOCS 813 Trade Contract Change Order (CM as Owner's Agent) form document with exhibits attached as necessary.

2.8.17 The Trade Contract Documents consist of this Agreement (as modified), the drawings, specifications, addenda issued prior to execution of this Agreement, approved submittals, information furnished by the Owner under subsection 4.1.3, the bid documents, other documents listed in this Agreement and any modifications issued after execution.

2.8.18 The Trade Contract Price is the amount indicated in section 7.1 of this Agreement.

2.8.19 The Trade Contract Time is the period between the Date of Commencement and Final Completion.

2.8.20 Trade Contract Work means the construction and services provided by the Trade Contractor.

2.8.20.1 Changed Work means work that is different from the original scope of Trade Contract Work; or work that changes the Trade Contract Price or Trade Contract Time.

2.8.20.2 Defective Work is any portion of the Trade Contract Work that is not in conformance with the Trade Contract Documents.

2.8.21 The Trade Contractor is the person or entity identified in ARTICLE 1 and includes the Trade Contractor's Representative.

2.8.22 The term Work means the construction and services necessary or incidental to fulfill the Trade

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Contractors' obligations for the Project. The Work may refer to the whole Project or only a part of the Project.

2.8.23 Worksite means the geographical area at the location of the Project as identified in ARTICLE 1 where the Trade Contract Work is to be performed.

ARTICLE 3 TRADE CONTRACTOR'S OBLIGATIONS

3.1 GENERAL RESPONSIBILITIES

3.1.1 RESPONSIBILITIES The Trade Contractor shall provide all of the labor, materials, equipment and services necessary to complete the Trade Contract Work, all of which shall be provided in full accord with or as reasonably inferable from the Trade Contract Documents as being necessary to produce the indicated results.

3.1.2 The Trade Contractor shall be responsible for the supervision and coordination of the Trade Contract Work, including the construction means, methods, techniques, sequences and procedures utilized, unless the Trade Contract Documents give other specific instructions. In such case, the Trade Contractor shall not be liable to the Owner for damages resulting from compliance with such instructions unless the Trade Contractor recognized and failed to timely report to the Owner any error, inconsistency, omission or unsafe practice that it discovered in the specified constructionmeans, methods, techniques, safety, sequences or procedures.

3.1.3 The Trade Contractor shall perform Trade Contract Work only within locations allowed by the Trade Contract Documents, applicable permits and applicable local law.

3.2 COOPERATION WITH WORK OF OWNER AND OTHERS

3.2.1 The Owner may perform work at the Worksite directly or by Others. Any agreements with Others to perform construction or operations related to the Project shall include provisions pertaining to insurance, indemnification, waiver of subrogation, coordination, interference, clean up and safety which are substantively the same as the corresponding provisions of this Agreement.

3.2.2 In the event that the Owner elects to perform work at the Worksite directly or by Others, the Trade Contractor and the Owner shall, with the assistance of the Construction Manager, coordinate the activities of all forces at the Worksite and agree upon fair and reasonable schedules and operational procedures for Worksite activities. The Owner shall require each separate contractor to cooperate with the Trade Contractor and assist with the coordination of activities and the review of construction schedules and operations. The Trade Contract Price and Trade Contract Time shall be equitably adjusted, as mutually agreed by the Parties, for subsequent changes made necessary by the coordination of construction activities, and the Trade Contactor's construction schedule and the Construction Schedule shall be revised accordingly. The Trade Contractor, Owner and Others shall adhere to the revised Construction Schedule until it may subsequently be revised.

3.2.3 With regard to the work of the Owner and Others, the Trade Contractor shall (a) proceed with the Trade Contract Work in a manner which does not hinder, delay or interfere with the work of the Owner or Others or cause the work of the Owner or Others to become defective, (b) afford the Owner or Others reasonable access for introduction and storage of their materials and equipment and performance of their activities, and (c) coordinate the Trade Contractor's construction and operations with theirs as required by this section.

3.2.4 Before proceeding with any portion of the Trade Contract Work affected by the construction or operations of the Owner or Others, the Trade Contractor shall give the Owner and Construction

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Manager prompt written notification of any defects the Trade Contractor discovers in their work which will prevent the proper execution of the Trade Contract Work. The Trade Contractor's obligations in this section do not create a responsibility for the work of the Owner or Others, but are for the purpose of facilitating the Trade Contract Work. If the Trade Contractor does not notify the Owner and Construction Manager of patent defects interfering with the performance of the Trade Contract Work, the Trade Contractor acknowledges that the work of the Owner or Others is not defective and is acceptable for the proper execution of the Trade Contract Work. Following receipt of written notice from the Trade Contractor of defects, the Owner, through the Construction Manager, shall promptly inform the Trade Contractor what action, if any, the Trade Contractor shall take with regard to the defects.

3.3 RESPONSIBILITY FOR PERFORMANCE

3.3.1 In order to facilitate its responsibilities for completion of the Work in accordance with and as reasonably inferable from the Trade Contract Documents, prior to commencing the Work the Trade Contractor shall examine and compare the drawings and specifications with information furnished by the Owner pursuant to subsection 4.1.3, relevant field measurements made by the Trade Contractor and any visible conditions at the Worksite affecting the Trade Contract Work.

3.3.2 If in the course of the performance of the obligations in subsection 3.3.1 the Trade Contractor discovers any errors, omissions or inconsistencies in the Contract Documents, the Trade Contractor shall promptly report them to the Owner and Construction Manager. It is recognized, however, that the Trade Contractor is not acting in the capacity of a licensed design professional, and that the Trade Contractor's examination is to facilitate construction and does not create an affirmative responsibility to detect errors, omissions or inconsistencies or to ascertain compliance with applicable laws, building codes or regulations. Following receipt of written notice from the Trade Contractor of defects, the Owner shall promptly inform the Trade Contractor what action, if any, the Trade Contractor shall take with regard to the defects.

3.3.3 The Trade Contractor shall have no liability for errors, omissions or inconsistencies discovered under subsections 3.3.1 and 3.3.2 unless the Trade Contractor fails to report a recognized problem to the Owner and Construction Manager.

3.3.4 The Trade Contractor may be entitled to additional costs or time if there are changes in the scope of the Trade Contract Work that increase the cost of the Work or increase the number of days required to perform the Work, respectively, because of clarifications or instructions arising out of the Trade Contractor's reports described in the three preceding Subsections.

3.4 CONSTRUCTION PERSONNEL AND SUPERVISION

3.4.1 The Trade Contractor shall provide competent supervision for the performance of the Trade Contract Work. Before commencing the Trade Contract Work, Trade Contractor shall notify Owner and Construction Manager in writing of the name and qualifications of its proposed superintendent(s) and project manager so Owner and Construction Manager may review the individual's qualifications. If, for reasonable cause, the Owner or Construction Manager refuses to approve the individual, or withdraws its approval after once giving it, Trade Contractor shall name a different superintendent or project manager for Owner's and Construction Manager's review. Any disapproved superintendent shall not perform in that capacity thereafter at the Worksite.

3.4.2 The Trade Contractor shall be responsible to the Owner for acts or omissions of parties or entities performing portions of the Trade Contract Work for or on behalf of the Trade Contractor or any of its Subcontractors.

3.4.3 The Trade Contractor shall permit only qualified persons to perform the Trade Contract Work. The

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Trade Contractor shall enforce safety procedures, strict discipline and good order among persons performing the Trade Contract Work. If the Owner or Construction Manager determines that a particular person does not follow safety procedures, or is unfit or unskilled for the assigned work, the Trade Contractor shall immediately reassign the person on receipt of the Owner's or Construction Manager's written notice to do so.

3.4.4 TRADE CONTRACTOR'S REPRESENTATIVE The Trade Contractor's authorized representative is . The Trade Contractor's representative shall possess full authority to receive instructions from the Owner and to act on those instructions. The Trade Contractor shall notify the Owner and the Construction Manager in writing of a change in the designation of the Trade Contractor's representative. The Trade Contractor's representative is also authorized to bind the Trade Contractor in all matters relating to this Agreement including, without limitation, all matters requiring the Trade Contractor's approval, authorization, or written notice. The Trade Contractor's representative is also authorized to resolve disputes in accordance with Section 12.2 of this Agreement.

3.5 MATERIALS FURNISHED BY THE OWNER OR OTHERS

3.5.1 In the event the Trade Contract Work includes installation of materials or equipment furnished by the Owner or Others, it shall be the responsibility of the Trade Contractor to examine the items so provided and thereupon handle, store and install the items, unless otherwise provided in the Trade Contract Documents, with such skill and care as to provide a satisfactory and proper installation. Loss or damage due to acts or omissions of the Trade Contractor shall be the responsibility of the Trade Contractor and may be deducted from any amounts due or to become due the Trade Contractor. Any defects discovered in such materials or equipment shall be reported at once to the Owner and Construction Manager. Following receipt of written notice from the Trade Contractor of defects, the Owner shall promptly inform the Trade Contractor what action, if any, the Trade Contractor shall take with regard to the defects.

3.6 TESTS AND INSPECTIONS

3.6.1 The Trade Contractor shall schedule all required tests, approvals and inspections of the Trade Contract Work or portions thereof at appropriate times so as not to delay the progress of the Trade Contract Work or other work related to the Project. The Trade Contractor shall give proper notice to the Construction Manager and to all required parties of such tests, approvals and inspections. If feasible, the Owner and Others may timely observe the tests at the normal place of testing. Except as provided in subsection 3.6.3, the Owner shall bear all expenses associated with tests, inspections and approvals required by the Trade Contract Documents, which, unless otherwise agreed to, shall be conducted by an independent testing laboratory or entity retained by the Owner. Unless otherwise required by the Trade Contract Documents, required certificates of testing, approval or inspection shall be secured by the Trade Contractor and promptly delivered to the Owner and Construction Manager.

3.6.2 If the Owner, Construction Manager or appropriate authorities determine that tests, inspections or approvals in addition to those required by the Trade Contract Documents will be necessary, the Trade Contractor shall arrange for the procedures and give timely notice to the Owner, Construction Manager and Others who may observe the procedures. Costs of the additional tests, inspections or approvals are at the Owner's expense except as provided in subsection 3.6.3.

3.6.3 If the procedures described in subsections 3.6.1 and 3.6.2 indicate that portions of the Trade Contract Work fail to comply with the Trade Contract Documents, the Trade Contractor shall be responsible for costs of correction and retesting.

3.7 WARRANTY

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3.7.1 The Trade Contract Work shall be executed in accordance with the Trade Contract Documents in a workmanlike manner. The Trade Contractor warrants that all materials and equipment shall be furnished in sufficient quantities to facilitate the proper and expeditious execution of the Trade Contract Work and shall be new unless otherwise specified, of good quality, in conformance with the Trade Contract Documents, and free from defective workmanship and materials. At the Owner's or Construction Manager's request, the Trade Contractor shall furnish satisfactory evidence of the quality and type of materials and equipment furnished. The Trade Contractor further warrants that the Trade Contract Work shall be free from material defects not intrinsic in the design or materials required in the Trade Contract Documents. The Trade Contractor's warranty does not include remedies for defects or damages caused by normal wear and tear during normal usage, use for a purpose for which the Project was not intended, improper or insufficient maintenance, modifications performed by the Owner or Others, or abuse. The Trade Contractor's warranty pursuant to this section shall commence on the Date of Substantial Completion.

3.7.2 The Trade Contractor shall obtain from its Subcontractors and material suppliers any special or extended warranties required by the Trade Contract Documents. All such warranties shall be listed in an attached Exhibit to this Agreement.

3.8 CORRECTION OF TRADE CONTRACT WORK WITHIN ONE YEAR

3.8.1 If, prior to Substantial Completion and within one year after the date of Substantial Completion of the Trade Contract Work, any Defective Work is found, the Owner shall promptly notify the Trade Contractor in writing. Unless the Owner provides written acceptance of the condition, the Trade Contractor shall promptly correct the Defective Work at its own cost and time and bear the expense of additional services required for correction of any Defective Work for which it is responsible. If within the one-year correction period the Owner discovers and does not promptly notify the Trade Contractor or give the Trade Contractor an opportunity to test or correct Defective Work as reasonably requested by the Trade Contractor, the Owner waives the Trade Contractor's obligation to correct that Defective Work as well as the Owner's right to claim a breach of the warranty with respect to that Defective Work.

3.8.2 With respect to any portion of Trade Contract Work first performed after Substantial Completion, the one-year correction period shall be extended by the period of time between Substantial Completion and the actual performance of the later Trade Contract Work. Correction periods shall not be extended by corrective work performed by the Trade Contractor.

3.8.3 If the Trade Contractor fails to correct Defective Work within a reasonable time after receipt of written notice from the Owner prior to final payment, the Owner may correct it in accordance with the Owner's right to carry out the Trade Contract Work in section 11.2. In such case, an appropriate Trade Contract Change Order shall be issued deducting the cost of correcting such deficiencies from payments then or thereafter due the Trade Contractor. If payments then or thereafter due Trade Contractor are not sufficient to cover such amounts, the Trade Contractor shall pay the difference to the Owner.

3.8.4 If after the one-year correction period but before the applicable limitation period the Owner discovers any Defective Work, the Owner shall, unless the Defective Work requires emergency correction, promptly notify the Trade Contractor. If the Trade Contractor elects to correct the Defective Work, it shall provide written notice of such intent within fourteen (14) Days of its receipt of notice from the Owner. The Trade Contractor shall complete the correction of Defective Work within a time frame mutually agreed upon by the Trade Contractor and the Owner. If the Trade Contractor does not elect to correct the Defective Work, the Owner may have the Defective Work corrected by itself or Others and charge the Trade Contractor for the reasonable cost of the correction and other directly related

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expenses. Owner shall provide Trade Contractor with an accounting of correction costs it incurs.

3.8.5 If the Trade Contractor's correction or removal of Defective Work causes damage to or destroys other completed or partially completed Work or existing buildings, the Trade Contractor shall be responsible for the cost of correcting the destroyed or damaged property.

3.8.6 The one-year period for correction of Defective Work does not constitute a limitation period with respect to the enforcement of the Trade Contractor's other obligations under the Trade Contract Documents.

3.8.7 Prior to final payment, at the Owner's option and with the Trade Contractor's agreement, the Owner may elect to accept Defective Work rather than require its removal and correction. In such case the Contract Price shall be equitably adjusted for any diminution in the value of the Project caused by such Defective Work. Before the Owner accepts any such change it must be documented in writing with a Change Order signed by both the Trade Contractor and Owner.

3.9 CORRECTION OF COVERED TRADE CONTRACT WORK

3.9.1 On request of the Owner or Construction Manager, Trade Contract Work that has been covered without a requirement that it be inspected prior to being covered may be uncovered for the Owner's or Construction Manager's inspection. The Owner shall pay for the costs of uncovering and replacement if the Work proves to be in conformance with the Trade Contract Documents, or if the defective condition was caused by the Owner or Others. If the uncovered Trade Contract Work proves to be defective, the Trade Contractor shall pay the costs of uncovering and replacement.

3.9.2 If contrary to specific requirements in the Trade Contract Documents or contrary to a specific request from the Owner or Construction Manager, a portion of the Trade Contract Work is covered, the Owner or Construction Manager, by written request, may require the Trade Contractor to uncover the Trade Contract Work for the Owner's or Construction Manager's observation. In this circumstance the Trade Contract Work shall be uncovered and recovered at the Trade Contractor's expense and with no adjustment to the Trade Contract Time. Costs incurred by the Owner as a direct result of the above shall be deducted from the Trade Contract Price.

3.10 SAFETY OF PERSONS AND PROPERTY

3.10.1 SAFETY PRECAUTIONS AND PROGRAMS The Trade Contractor shall have overall responsibility for safety precautions and programs in the performance of the Trade Contract Work. While this section establishes the responsibility for safety between the Owner and Trade Contractor, it does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with the provisions of applicable laws and regulations.

3.10.2 The Trade Contractor shall seek to avoid injury, loss or damage to persons or property by taking reasonable steps to protect:

3.10.2.1 its employees and other persons at the Worksite;

3.10.2.2 materials and equipment stored at on-site or off-site locations for use in the Trade Contract Work; and

3.10.2.3 property located at the site and adjacent to Trade Contract Work areas, whether or not the property is part of the Trade Contract Work.

3.10.3 TRADE CONTRACTOR'S SAFETY REPRESENTATIVE The Trade Contractor's Worksite Safety Representative is who shall act as the Trade Contractor's authorized safety representative with a duty

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to prevent accidents in accordance with subsection 3.10.2 If no individual is identified in this section, the authorized safety representative shall be the Trade Contractor's Representative. The Trade Contractor shall report immediately in writing to the Owner and Construction Manager all recordable accidents and injuries occurring at the Worksite. When the Trade Contractor is required to file an accident report with a public authority, the Trade Contractor shall furnish a copy of the report to the Owner and Construction Manager.

3.10.4 The Trade Contractor shall provide the Owner and Construction Manager with copies of all notices required of the Trade Contractor by law or regulation. The Trade Contractor's safety program shall comply with the requirements of governmental and quasi-governmental authorities having jurisdiction.

3.10.5 Damage or loss not insured under property insurance which may arise from the Trade Contract Work, to the extent caused by the negligent acts or omissions of the Trade Contractor, or anyone for whose acts the Trade Contractor may be liable, shall be promptly remedied by the Trade Contractor.

3.10.6 If the Owner or Construction Manager deems any part of the Trade Contract Work or Worksite unsafe, the Owner or Construction Manager, without assuming responsibility for the Trade Contractor's safety program, may require the Trade Contractor to stop performance of the Trade Contract Work or take corrective measures satisfactory to the Owner, or both. If the Trade Contractor does not adopt corrective measures, the Owner may perform them and deduct their cost from the Trade Contract Price. The Trade Contractor agrees to make no claim for damages, for an increase in the Trade Contract Price or for a change in the Trade Contract Time based on the Trade Contractor's compliance with the Owner's or Construction Manager's reasonable request.

3.11 EMERGENCIES

3.11.1 In an emergency, the Trade Contractor shall act in a reasonable manner to prevent personal injury or property damage. Any change in the Trade Contract Price or Trade Contract Time resulting from the actions of the Trade Contractor in an emergency situation shall be determined as provided in ARTICLE 8.

3.12 HAZARDOUS MATERIALS

3.12.1 The Trade Contractor shall not be obligated to commence or continue Trade Contract Work until any Hazardous Material discovered at the Worksite has been removed, rendered or determined to be harmless by the Owner as certified by an independent testing laboratory and approved by the appropriate government agency.

3.12.2 If after the commencement of the Trade Contract Work a Hazardous Material is discovered at the Worksite, the Trade Contractor shall be entitled to immediately stop Trade Contract Work in the affected area. The Trade Contractor shall report the condition to the Owner, the Construction Manager, and, if required, the government agency with jurisdiction.

3.12.3 The Trade Contractor shall not be required to perform any Trade Contract Work relating to or in the area of Hazardous Material without written mutual agreement.

3.12.4 The Owner shall be responsible for retaining an independent testing laboratory to determine the nature of the Hazardous Material encountered and whether the material requires corrective measures or remedial action. Such measures shall be the sole responsibility of the Owner, and shall be performed in a manner minimizing any adverse effects upon the Trade Contract Work. The Trade Contractor shall resume Trade Contract Work in the area affected by any Hazardous Material only upon written agreement between the Parties after the Hazardous Material has been removed or rendered harmless

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and only after approval, if necessary, of the governmental agency with jurisdiction.

3.12.5 If the Trade Contractor incurs additional costs or is delayed due to the presence or remediation of Hazardous Material, the Trade Contractor shall be entitled to an equitable adjustment in the Trade Contract Price or the Trade Contract Time.

3.12.6 To the extent not caused by the negligent acts or omissions of the Trade Contractor, its Subcontractors and Sub-subcontractors, and the agents, officers, directors and employees of each of them, the Owner shall defend, indemnify and hold harmless the Trade Contractor, its Subcontractors and Sub-subcontractors, and the agents, officers, directors and employees of each of them, from and against any and all direct claims, damages, losses, costs and expenses, including but not limited to attorney's fees, costs and expenses incurred in connection with any dispute resolution process, to the extent permitted pursuant to section 6.6, arising out of or relating to the performance of the Trade Contract Work in any area affected by Hazardous Material. To the extent portions of this paragraph are in conflict with SF 396 (codified at Iowa Code Section 537A.5) said portions are void and unenforceable.

3.12.7 MATERIALS BROUGHT TO THE WORKSITE

3.12.7.1 Material Safety Data (MSD) sheets as required by law and pertaining to materials or substances used or consumed in the performance of the Trade Contract Work, whether obtained by the Trade Contractor, Subcontractors, the Owner or Others, shall be maintained at the Worksite by the Trade Contractor and made available to the Owner, Construction Manager, Subcontractors and Others.

3.12.7.2 The Trade Contractor shall be responsible for the proper delivery, handling, application, storage, removal and disposal of all materials and substances brought to the Worksite by the Trade Contractor in accordance with the Trade Contract Documents and used or consumed in the performance of the Trade Contract Work.

3.12.7.3 The Trade Contractor shall indemnify and hold harmless the Owner, Construction Manager, their agents, officers, directors and employees, from and against any and all claims, damages, losses, costs and expenses, including but not limited to attorney's fees, costs and expenses incurred in connection with any dispute resolution procedure, arising out of or relating to the delivery, handling, application, storage, removal and disposal of all materials and substances brought to the Worksite by the Trade Contractor in accordance or not in accordance with the Trade Contract Documents. To the extent portions of this paragraph are in conflict with SF 396 (codified at Iowa Code Section 537A.5) said portions are void and unenforceable.

3.12.8 The terms of this section shall survive the completion of the Trade Work or any termination of this Agreement.

3.13 SUBMITTALS

3.13.1 The Trade Contractor shall submit to the Construction Manager, and the Design Professional, for review and approval all shop drawings, samples, product data and similar submittals required by the Trade Contract Documents. Submittals may be submitted in electronic form if required in accordance with ConsensusDocs 200.2 and subsection 4.4.1. The Trade Contractor shall be responsible to the Owner for the accuracy and conformity of its submittals to the Trade Contract Documents. The Trade Contractor shall prepare and deliver its submittals in a manner consistent with the Construction Schedule and in such time and sequence so as not to delay the performance of the Trade Contract Work or the work of the Owner and Others. When the Trade Contractor delivers its submittals the Trade Contractor shall identify in writing for each submittal all changes, deviations or substitutions from the requirements of the Trade Contract Documents. The review and approval of any Trade Contractor

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submittal shall not be deemed to authorize changes, deviations or substitutions from the requirements of the Trade Contract Documents unless express written approval is obtained from the Owner specifically authorizing such deviation, substitution or change. To the extent a change, deviation or substitution causes an impact to the Contract Price or Contract Time, such approval shall be promptly memorialized in a Change Order. Further, the Construction Manager and Design Professional shall not make any change, deviation or substitution through the submittal process without specifically identifying and authorizing such deviation to the Trade Contractor. In the event that the Trade Contract Documents do not contain submittal requirements pertaining to the Trade Contract Work, the Trade Contractor agrees upon request to submit in a timely fashion to the Construction Manager and the Design Professional for review and approval any shop drawings, samples, product data, manufacturers' literature or similar submittals as may reasonably be required by the Owner, Construction Manager, or Design Professional.

3.13.2 The Owner shall be responsible for review and approval of submittals with reasonable promptness to avoid causing delay.

3.13.3 The Trade Contractor shall perform all Trade Contract Work strictly in accordance with approved submittals. Approval of shop drawings is not authorization to Trade Contractor to perform Changed Work, unless the procedures of ARTICLE 8 are followed. Approval does not relieve the Trade Contractor from responsibility for Defective Work resulting from errors or omissions of any kind on the approved Shop Drawings.

3.13.4 Record copies of the following, incorporating field changes and selections made during construction, shall be maintained by the Trade Contractor at the Project site and available to the Owner upon request: drawings, specifications, addenda, Trade Contract Change Order and other modifications, and required submittals including product data, samples and shop drawings.

3.13.5 No substitutions shall be made in the Trade Contract Work unless permitted in the Trade Contract Documents and then only after the Trade Contractor obtains approvals required under the Trade Contract Documents for substitutions. All such substitutions shall be promptly memorialized in a Change Order no later than seven (7) Days following approval by the Owner and, if applicable, provide for an adjustment in the Contract Price or Contract Time.

3.13.6 The Trade Contractor shall prepare and submit to the Construction Manager for submission to the Owner

(Check one only)

[X] final marked up as-built drawings

[ ] updated electronic data, in accordance with ConsensusDocs 200.2 and section 4.4.1

[ ] such documentation as defined by the Parties by attachment to this Agreement,

in general documenting how the various elements of the Trade Contract Work were actually constructed or installed.

3.14 PROFESSIONAL SERVICES

3.14.1 The Trade Contractor may be required to procure professional services in order to carry out its responsibilities for construction means, methods, techniques, sequences and procedures for such services specifically called for by the Contract Documents. The Trade Contractor shall obtain these professional services and any design certifications required from State of Iowa licensed design professionals. All drawings, specifications, calculations, certifications and submittals prepared by such

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design professionals shall bear the signature and seal of such design professionals and the Owner and the Design Professional shall be entitled to rely upon the adequacy, accuracy and completeness of such design services. If professional services are specifically required by the Contract Documents, the Owner shall indicate all required performance and design criteria. The Trade Contractor shall not be responsible for the adequacy of such performance and design criteria. The Trade Contractor shall not be required to provide such services in violation of existing laws, rules and regulations in the jurisdiction where the Project is located.

3.15 WORKSITE CONDITIONS

3.15.1 WORKSITE VISIT The Trade Contractor acknowledges that it has visited, or has had the opportunity to visit, the Worksite to visually inspect the general and local conditions which could affect the Trade Contract Work.

3.15.2 CONCEALED OR UNKNOWN SITE CONDITIONS If the conditions at the Worksite are (a) subsurface or other concealed physical conditions which are materially different from those indicated in the Trade Contract Documents, or (b) unusual and unknown physical conditions which are materially different from conditions ordinarily encountered and generally recognized as inherent in Trade Contract Work provided for in the Trade Contract Documents, the Trade Contractor shall stop Trade Contract Work and give immediate written notice of the condition to the Owner, Construction Manager and the Design Professional. The Trade Contractor shall not be required to perform any work relating to the unknown condition without the written mutual agreement of the Parties. Any change in the Contract Price or the Contract Time as a result of the unknown condition shall be determined as provided in this article. The Trade Contractor shall provide the Owner and the Construction Manager with written notice of any claim as a result of unknown conditions within the time period set forth in section 8.4.

3.16 PERMITS AND TAXES

3.16.1 Trade Contractor shall give public authorities all notices required by law and, except for permits and fees which are the responsibility of the Owner pursuant to section 4.2, shall obtain and pay for all necessary permits, licenses and renewals pertaining to the Trade Contract Work. Trade Contractor shall provide to Owner copies of all notices, permits, licenses and renewals required under this Agreement.

3.16.2 Trade Contractor shall pay all applicable taxes legally enacted when bids are received or negotiations concluded for the Trade Contract Work provided by the Trade Contractor.

3.16.3 The Contract Price or Contract Time shall be equitably adjusted by Trade Contract Change Order for additional costs resulting from any changes in laws, ordinances, rules and regulations enacted after the date of this Agreement, including increased taxes.

3.16.3 (Deleted)

3.17 CUTTING, FITTING AND PATCHING

3.17.1 The Trade Contractor shall perform cutting, fitting and patching necessary to coordinate the various parts of the Trade Contract Work and to prepare its Trade Contract Work for the work of the Owner or Others.

3.17.2 Cutting, patching or altering the work of the Owner or Others shall be done with the prior written approval of the Owner. Such approval shall not be unreasonably withheld.

3.18 CLEANING UP

3.18.1 The Trade Contractor shall regularly remove debris and waste materials at the Worksite resulting

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from the Trade Contract Work. Prior to discontinuing Trade Contract Work in an area, the Trade Contractor shall clean the area and remove all rubbish and its construction equipment, tools, machinery, waste and surplus materials. The Trade Contractor shall minimize and confine dust and debris resulting from construction activities. At the completion of the Trade Contract Work, the Trade Contractor shall remove from the Worksite all construction equipment, tools, surplus materials, waste materials and debris.

3.18.2 If the Trade Contractor fails to commence compliance with cleanup duties within two (2) business Days after written notification from the Owner or the Construction Manager of noncompliance, the Owner may implement appropriate cleanup measures without further notice and the cost shall be deducted from any amounts due or to become due the Trade Contractor in the next payment period.

3.19 ACCESS TO TRADE CONTRACT WORK The Trade Contractor shall facilitate the access of the Owner, Construction Manager, Design Professional and Others to Trade Contract Work in progress.

3.20 COST MONITORING The Trade Contractor shall provide the Construction Manager with cost monitoring information appropriate for the manner of Trade Contractor's compensation, to enable the Construction Manager to develop and track construction and project budgets, including amounts for work in progress, uncompleted work and proposed changes.

3.21 ROYALTIES, PATENTS AND COPYRIGHTS The Trade Contractor shall pay all royalties and license fees which may be due on the inclusion of any patented or copyrighted materials, methods or systems selected by the Trade Contractor and incorporated in the Trade Contract Work. The Trade Contractor shall defend, indemnify and hold the Owner harmless from all suits or claims for infringement of any patent rights or copyrights arising out of such selection. The Owner agrees to indemnify and hold the Trade Contractor harmless from any suits or claims of infringement of any patent rights or copyrights arising out of any patented or copyrighted materials, methods or systems specified by the Owner, Construction Manager and Design Professional. To the extent portions of this paragraph are in conflict with SF 396 (codified at Iowa Code Section 537A.5) said portions are void and unenforceable.

3.22 CONFIDENTIALITY The Owner shall treat as confidential information all of the Trade Contractor's estimating systems and historical and parameter cost data that may be disclosed to the Owner in connection with the performance of this Agreement if they are specified and marked as confidential and shall mark them. If a document is not marked as "Confidential" it will not be treated as such. Nothing contained herein, however, shall be interpreted in a manner that modifies or is in conflict with the purpose and application of the open records laws contained in the Code of Iowa.

ARTICLE 4 OWNER'S RESPONSIBILITIES

4.1 INFORMATION SERVICES

4.1.1 FULL INFORMATION Any information or services to be provided by the Owner shall be provided in a timely manner so as not to delay the Trade Contract Work.

4.1.2 FINANCIAL INFORMATION Upon the written request of the Trade Contractor, the Owner shall provide the Trade Contractor with evidence of Project financing. If requested in writing, evidence of such financing shall be a condition precedent to the Trade Contractor's commencing or continuing the Trade Contract Work. The Trade Contractor shall be notified by the Owner prior to any material change in Project financing.

4.1.3 WORKSITE INFORMATION Except to the extent that the Trade Contractor knows of any inaccuracy, the Trade Contractor is entitled to rely on Worksite information furnished by the Owner pursuant to this subsection. To the extent the Owner has obtained, or is required elsewhere in the

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Trade Contract Documents to obtain, the following Worksite information, the Owner shall provide at the Owner's expense and with reasonable promptness:

4.1.3.1 information describing the physical characteristics of the site, including surveys, site evaluations, legal descriptions, data or drawings depicting existing conditions, subsurface conditions and environmental studies, reports and investigations;

4.1.3.2 tests, inspections and other reports dealing with environmental matters, Hazardous Material and other existing conditions, including structural, mechanical and chemical tests, required by the Trade Contract Documents or by law; and

4.1.3.3 any other information or services requested in writing by the Trade Contractor which are relevant to the Trade Contractor's performance of the Trade Contract Work and under the Owner's control. The information required by subsection 4.1.3 shall be provided in reasonable detail. Legal descriptions shall include easements, title restrictions, boundaries, and zoning restrictions. Worksite descriptions shall include existing buildings and other construction and all other pertinent site conditions. Adjacent property descriptions shall include structures, streets, sidewalks, alleys, and other features relevant to the Trade Contract Work. Utility details shall include available services, lines at the Worksite and adjacent and connection points. The information shall include public and private information, subsurface information, grades, contours, and elevations, drainage data, exact locations and dimensions, and benchmarks that can be used by the Trade Contractor in laying out the Trade Contract Work. The Trade Contractor shall in writing request from the Owner any information identified in Paragraph 4.1.3 that the Trade Contractor believes the Owner has obtained but has not provided to the Trade Contractor.

4.1.3.4 OWNER'S REPRESENTATIVE The Owner's representative is test. The Owner's representative shall have authority to bind the Owner in all matters relating to this Agreement including, without limitation, all matters requiring the Owner's approval, authorization or written notice. If the Owner changes its representative as listed above, the Owner shall notify the Trade Contractor in advance in writing. The Owner's Representative is also authorized to resolve disputes in accordance with Section 12.2 of this Agreement. The Construction Manager, while unauthorized to modify the Agreement or settle a dispute without the Owner's approval, however, does have the requisite authority to act as the Owner's agent throughout the construction of the Project in accordance with the contract between the Owner and the Construction Manager (ConsensusDOCS 801 as modified by the State of Iowa).

4.2 BUILDING PERMIT, FEES AND APPROVALS Except for those permits and fees related to the Trade Contract Work which are the responsibility of the Trade Contractor pursuant to subsection 3.16.1, the Owner shall secure and pay for all other permits, approvals, easements, assessments and fees required for the development, construction, use or occupancy of permanent structures or for permanent changes in existing facilities, including the building permit.

4.3 Deleted

4.4 TRADE CONTRACT DOCUMENTS Unless otherwise specified, Owner shall provide One (1) copies of the Trade Contract Documents to the Trade Contractor without cost. Additional copies will be provided to the Trade Contractor at cost. This paragraph is not intended to be in conflict with Iowa Code Section 26.3 requirement that a sufficient number of copies of the contract documents be made available to bidders without charge (but a deposit not to exceed $250 per set may be required). If the Trade Contractor was required to make a deposit for a set of Trade Contract Documents for purposes of bidding then the Trade Contractor may elect to have the deposit returned instead of being provided with an additional copy.

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4.4.1 DIGITIZED DOCUMENTS If the Owner requires that the Owner, Design Professional, Construction Manager and Trade Contractor exchange documents and data in electronic or digital form, prior to any such exchange, the Owner, Design Professional, Construction Manager and Trade Contractor shall agree on a written protocol governing all exchanges in ConsensusDocs 200.2 or a separate Agreement, which, at a minimum, shall specify: (a) the definition of documents and data to be accepted in electronic or digital form or to be transmitted electronically or digitally; (b) management and coordination responsibilities; (c) necessary equipment, software and services; (d) acceptable formats, transmission methods and verification procedures; (e) methods for maintaining version control; (f) privacy and security requirements; and (g) storage and retrieval requirements. Except as otherwise agreed to by the Parties in writing, the Parties shall each bear their own costs as identified in the protocol. In the absence of a written protocol, use of documents and data in electronic or digital form shall be at the sole risk of the recipient.

4.5 OWNER'S CUTTING AND PATCHING Cutting, patching or altering the Trade Contract Work by the Owner or Others shall be done with the prior written approval of the Trade Contractor, which approval shall not be unreasonably withheld.

4.6 OWNER'S RIGHT TO CLEAN UP In case of a dispute between the Trade Contractor and Others with regard to respective responsibilities for cleaning up at the Worksite, the Owner may implement appropriate cleanup measures after two (2) business Days' notice and allocate the cost among those responsible during the following pay period.

4.7 COST OF CORRECTING DAMAGED OR DESTROYED WORK With regard to damage or loss attributable to the acts or omissions of the Owner or Others and not to the Trade Contractor, the Owner may either (a) promptly remedy the damage or loss or (b) accept the damage or loss. If the Trade Contractor incurs additional costs or is delayed due to such loss or damage, the Trade Contractor shall be entitled to an equitable adjustment in the Trade Contract Price or Trade Contract Time.

ARTICLE 5 SUBCONTRACTS

5.1 SUBCONTRACTORS The Trade Contract Work not performed by the Trade Contractor with its own forces shall be performed by Subcontractors.

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

5.2.0 The Trade Contractor must identify all Subcontractors and suppliers within 48 hours of the published date and time for which bids must be submitted, in accordance with Iowa Code Section 8A.311, as amended by House File 646 in 2011. Subcontractors and suppliers may not be changed without the approval of the Owner. Requests for changing a Subcontractor or supplier must identify the reason for the proposed change, the name of the new Subcontractor or supplier, and the change in the subcontractor or supplier price as a result of the change. Any reduction in subcontractor or supplier price as a result of the change, if the change is approved by the Owner, shall be deducted from the Trade Contract Price via a deductive Change Order. Any such changes, if approved by the Owner, which result in an increase in the Trade Contract Price shall be borne by the Trade Contractor.

5.2.1 If the Owner has a reasonable objection to any proposed subcontractor or material supplier, the Owner shall notify the Trade Contractor in writing.

5.2.2 If the Owner has reasonably and promptly objected as provided in subsection 5.2.1, the Trade Contractor shall not contract with the proposed subcontractor or material supplier, and the Trade Contractor shall propose another Subcontractor acceptable to the Owner. To the extent the substitution results in an increase or decrease in the Trade Contract Price or Trade Contract Time, an appropriate

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Trade Contract Change Order shall be issued as provided in ARTICLE 8.

5.3 BINDING OF SUBCONTRACTORS The Trade Contractor agrees to bind every Subcontractor (and require every Subcontractor to so bind its subcontractors) to all the provisions of this Agreement and the Trade Contract Documents as they apply to the Subcontractor's portion of the Trade Contract Work.

5.4 Deleted

5.5 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

5.5.1 If this Agreement is terminated, each subcontract agreement shall be assigned by the Trade Contractor to the Owner, subject to the prior rights of any surety, provided that:

5.5.1.1 this Agreement is terminated by the Owner pursuant to sections 11.3 or 11.4; and

5.5.1.2 the Owner accepts such assignment after termination by notifying the Subcontractor and Trade Contractor in writing, and assumes all rights and obligations of the Contractor pursuant to each subcontract agreement.

5.5.2 If the Owner accepts such an assignment, and the Work has been suspended for more than thirty (30) consecutive Days, following termination, if appropriate, the Subcontractor's compensation shall be equitably adjusted as a result of the suspension.

ARTICLE 6 TRADE CONTRACT TIME

6.1 PERFORMANCE OF THE TRADE CONTRACT WORK

6.1.1 DATE OF COMMENCEMENT The Date of Commencement is the date of Owner's written notice to proceed unless otherwise set forth below:

6.1.2 TIME Substantial Completion of the Trade Contract Work shall be achieved in XXX (XX) Days from the Date of Commencement. Unless otherwise specified in the Certificate of Substantial Completion, the Trade Contractor shall achieve Final Completion within 30 Days after the date of Substantial Completion, subject to adjustments as provided for in the Trade Contract Documents.

6.1.3 Time limits stated above are of the essence of this Agreement.

6.1.4 Unless instructed by the Owner in writing, the Trade Contractor shall not knowingly commence the Trade Contract Work before the effective date of insurance to be provided by the Trade Contractor and Owner as required by the Trade Contract Documents.

6.2 CONSTRUCTION SCHEDULE Prior to the commencement of the construction of the Trade Contract Work, the Trade Contractor shall submit a copy of its critical path method (CPM) construction schedule showing the completion of the Trade Contract Work within the allowable number of days identified above. The Trade Contractor shall regularly update its CPM construction schedule for the Trade Contract Work and promptly furnish the Construction Manager on an ongoing basis scheduling information requested by the Construction Manager for the Trade Contract Work. In consultation with the Trade Contractor, the Construction Manager shall incorporate the Trade Contract Work and work of other trade contractors into an overall Construction Schedule for the entire Project. The Trade Contractor shall be bound by the Construction. Nothing in this Trade Contractor Agreement shall relieve the Trade Contractor of any liability for any unexcused failure to comply with its original schedule, the Construction Schedule, or any completion dates. The Construction Manager shall have the right to coordinate the Trade Contractors, including the right, if necessary, to change the time, order and priority in which the various portions of the Trade Contract Work and the other work associated with the Project shall be performed.

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6.3 DELAYS AND EXTENSIONS OF TIME

6.3.1 If the Trade Contractor is delayed at any time in the commencement or progress of the Work by any cause beyond the control of the Trade Contractor, the Trade Contractor shall be entitled to an equitable extension of the Trade Contract Time if the Trade Contractor is able to show that the critical path of the Trade Contract Work was delayed by causes beyond the control of the Trade Contractor. Examples of causes beyond the control of the Trade Contractor include, but are not limited to, the following: acts or omissions of the Owner, the Design Professional, Construction Manager or Others; changes in the Work or the sequencing of the Work ordered by the Owner, or arising from decisions of the Owner that impact the time of performance of the Work; transportation delays not reasonably foreseeable; labor disputes not involving the Trade Contractor; general labor disputes impacting the Project but not specifically related to the Worksite; fire; terrorism, epidemics, adverse governmental actions, unavoidable accidents or circumstances; adverse weather conditions not reasonably anticipated; encountering Hazardous Materials; concealed or unknown conditions; delay authorized by the Owner pending dispute resolution; and suspension by the Owner under section 11.1. The Trade Contractor shall submit any requests for equitable extensions of Contract Time in accordance with the provisions of ARTICLE 8.

6.3.2 In addition, if the Trade Contractor is able to show that it incurred additional costs because the critical path of the Trade Contract Work was delayed by acts or omissions of the Owner, the Design Professional, Construction Manager or Others, changes in the Work or the sequencing of the Work ordered by the Owner, or arising from decisions of the Owner that impact the time of performance of the Work, encountering Hazardous Materials, or concealed or unknown conditions, delay authorized by the Owner pending dispute resolution or suspension by the Owner under section 11.1, then the Trade Contractor shall be entitled to an equitable adjustment in the Trade Contract Price subject to section 6.6.

6.3.3 NOTICE OF DELAYS In the event delays to the Trade Contract Work are encountered for any reason, the Trade Contractor shall provide prompt written notice to the Owner and the Construction Manager of the cause of such delays after Trade Contractor first recognizes the delay. The Owner and Trade Contractor agree to undertake reasonable steps to mitigate the effect of such delays.

6.4 NOTICE OF DELAY CLAIMS If the Trade Contractor believes it is due an equitable extension of Trade Contract Time or an equitable adjustment in Trade Contract Price as a result of a delay described in subsection 6.3.1, the Trade Contractor shall give the Owner and the Construction Manager written notice of the claim in accordance with section 8.4. If the Trade Contractor causes delay in the completion of the Trade Contract Work, the Owner shall be entitled to recover its additional costs subject to subsection 6.6. The Owner shall process any such claim against the Trade Contractor in accordance with ARTICLE 8.

6.5 LIQUIDATED DAMAGES

6.5.1 SUBSTANTIAL COMPLETION The Owner and the Trade Contractor agree that this Agreement ☐ shall / ☒ shall not (indicate one) provide for the imposition of liquidated damages based on the Date of Substantial Completion.

6.5.1.1 The Trade Contractor understands that if the Date of Substantial Completion established by this Agreement, as may be amended by subsequent Trade Change Order, is not attained, the Owner will suffer damages which are difficult to determine and accurately specify. The Trade Contractor agrees that if the Date of Substantial Completion is not attained the Trade Contractor shall pay the Owner Zero Dollars and No Cents ($0.00) as liquidated damages and not as a penalty for each day that Substantial Completion extends beyond the Date of Substantial Completion. The liquidated damages provided herein shall be in lieu of all liability for any and all

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extra costs, losses, expenses, claims, penalties and any other damages of whatsoever nature incurred by the Owner which are occasioned by any delay in achieving the Date of Substantial Completion.

6.5.2 FINAL COMPLETION The Owner and the Trade Contractor agree that this Agreement ☐ shall / ☒ shall not (indicate one) provide for the imposition of liquidated damages based on the Date of Final Completion.

6.5.2.1 The Trade Contractor understands that if the Date of Final Completion established by this Agreement, as may be amended by subsequent Trade Change Order is not attained, the Owner will suffer damages which are difficult to determine and accurately specify. The Trade Contractor agrees that if the Date of Final Completion is not attained the Trade Contractor shall pay the Owner Zero Dollars and No Cents ($0.00) as liquidated damages and not as a penalty for each day that Final Completion extends beyond the Date of Final Completion. The liquidated damages provided herein shall be in lieu of all liability for any and all extra costs, losses, expenses, claims, penalties and any other damages of whatsoever nature incurred by the Owner which are occasioned by any delay in achieving the Date of Final Completion.

6.5.3 OTHER LIQUIDATED DAMAGES The Owner and the Trade Contractor may agree upon the imposition of liquidated damages based on other project milestones or performance requirements. Such agreement shall be included as an exhibit to this Agreement.

6.6 LIMITED MUTUAL WAIVER OF CONSEQUENTIAL DAMAGES Except for damages mutually agreed upon by the Parties as liquidated damages in Section 6.5 and excluding losses covered by insurance required by the Trade Contract Documents, the Owner and the Trade Contractor agree to waive all claims against each other for any consequential damages that may arise out of or relate to this Agreement, except for those specific items of damages excluded from this waiver as mutually agreed upon by the Parties and identified below. The Owner agrees to waive damages including but not limited to the Owner's loss of use of the Project, any rental expenses incurred, loss of income, profit or financing related to the Project, as well as the loss of business, loss of financing, principal office overhead and expenses, loss of profits not related to this Project, loss of reputation, or insolvency. The Trade Contractor agrees to waive damages including but not limited to loss of business, loss of financing, principal office overhead and expenses, loss of profits not related to this Project, loss of bonding capacity, loss of reputation, or insolvency. The provisions of this section shall also apply to the termination of this Agreement and shall survive such termination.

6.6.1 The following items of damages are excluded from this mutual waiver: The provisions of this section shall also apply to the termination of this Agreement and shall survive such termination. The Owner and the Trade Contractor shall require similar waivers in contracts with Subcontractors and Others retained for the Project.

ARTICLE 7 TRADE CONTRACT PRICE

7.1 LUMP SUM As full compensation for performance by the Trade Contractor of the Work in conformance with the Contract Documents, the Owner shall pay the Trade Contractor the lump sum price of: XX dollars and XX cents ($XX.XX) . The lump sum price is hereinafter referred to as the Trade Contract Price, which shall be subject to increase or decrease as provided in article 8.

Lump Sum Price includes Base Bid of $X.XX and Alternate #XX for {alternate description} for $X.XX for a total Lump Sum Price of $X.XX.

7.2 ALLOWANCES

7.2.1 All allowances stated in the Trade Contract Documents shall be included in the Trade Contract Price. The Owner shall select allowance items in a timely manner so as not to delay the Trade Contract

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Work.

7.2.2 Allowances shall include the costs of materials, supplies and equipment delivered to the Worksite, less applicable trade discounts and including requisite taxes, unloading and handling at the Worksite, and labor and installation, unless specifically stated otherwise. The Trade Contractor's Overhead and profit for the allowances shall be included in the Trade Contract Price, but not in the allowances. The Trade Contract Price shall be adjusted by Trade Contract Change Order to reflect the actual costs when they are greater than or less than the allowances.

ARTICLE 8 CHANGES

Changes in the Trade Contract Work that are within the general scope of this Agreement shall be accomplished, without invalidating this Agreement, by Trade Contract Change Order, and Trade Contract Interim Directed Change.

8.1 TRADE CHANGE ORDER

8.1.1 The Owner may order or the Trade Contractor may request changes in the Trade Contract Work or the timing or sequencing of the Trade Contract Work that impacts the Trade Contract Price or the Trade Contract Time. All such changes in the Trade Contract Work that affect Trade Contract Time or Trade Contract Price shall in the form of a Trade Contract Change Order. Any such requests for a change in the Trade Contract Price or the Trade Contract Time shall be processed in accordance with this article 8. Trade Contract Change Orders shall be executed on the ConsensusDOCS 813 - Trade Contract Change Order (CM as Owner's Agent) with attachments as necessary.

8.1.2 The Owner, with the assistance of the Construction Manager, and the Trade Contractor shall negotiate in good faith an appropriate adjustment to the Trade Contract Price or the Trade Contract Time and shall conclude these negotiations as expeditiously as possible. Acceptance of the Trade Contract Change Order and any adjustment in the Trade Contract Price or Trade Contract Time shall not be unreasonably withheld.

8.2 TRADE CONTRACT INTERIM DIRECTED CHANGE

8.2.1 The Construction Manager may issue a written Trade Contract Interim Directed Change signed by the Owner directing a change in the Trade Contract Work prior to reaching agreement with the Trade Contractor on the adjustment, if any, in the Trade Contract Price or the Trade Contract Time.

8.2.2 The Owner, with the assistance of the Construction Manager, and the Trade Contractor shall negotiate expeditiously and in good faith for appropriate adjustments, as applicable, to the Trade Contract Price or the Trade Contract Time arising out of a Trade Contract Interim Directed Change. As the Trade Contract Changed Work is performed, the Trade Contractor shall submit its costs for such work with its application for payment beginning with the next application for payment within thirty (30) Days of the issuance of the Trade Contract Interim Directed Change. If there is a dispute as to the cost to the Owner, the Trade Contractor shall continue to perform the, Trade Contract Changed Work set forth in the Trade Contract Interim Directed Change and the Owner shall pay the requirements Trade Contractor the Cost of the Work, defined in 8.3.1.3 below upon receipt of an application for payment and the Owner's (and the Architect's and construction manger's) determination that the work has been completed. The Parties reserve their rights as to the disputed amount, subject to the requirements ARTICLE 12.

8.2.3 When the Owner and the Trade Contractor agree upon the adjustment in the Trade Contract Price or the Trade Contract Time, for a change in the Trade Contract Work directed by a Trade Contract Interim Directed Change, such agreement shall be the subject of a Trade Contract Change Order. The

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Trade Contract Change Order shall include all outstanding Trade Contract Interim Directed Changes on which the Owner and Trade Contractor have reached agreement on Contract Price or Contract Time issued since the last Trade Contract Change Order.

8.3 DETERMINATION OF COST

8.3.1 An increase or decrease in the Trade Contract Price or the Trade Contract Time resulting from a change in the Trade Contract Work shall be determined by one or more of the following methods:

8.3.1.1 unit prices set forth in this Agreement or as subsequently agreed;

8.3.1.2 a mutually accepted, itemized lump sum;

8.3.1.3 COST OF THE WORK Cost of the Work as defined by this subsection plus 10.0 % for Overhead and 5.0 % for profit. "Cost of the Work" shall include the following costs reasonably incurred to perform a change in the Work

8.3.1.3.1 wages paid for labor in the direct employ of the Constructor in the performance of the Work;

8.3.1.3.2 salaries of the Trade Contractor's employees when stationed at the field office to the extent necessary to complete the applicable Work, employees engaged on the road expediting the production or transportation of material and equipment, and supervisory employees from the principal or branch office performing the functions listed below;

8.3.1.3.3 cost of applicable employee benefits and taxes, including but not limited to, workers' compensation, unemployment compensation, social security, health, welfare, retirement and other fringe benefits as required by law, labor agreements, or paid under the Trade Contractor's standard personnel policy, insofar as such costs are paid to employees of the Trade Contractor who are included in the Cost of the Work in subsections .1 and .2 immediately above;

8.3.1.3.4 reasonable transportation, travel, and hotel expenses of the Trade Contractor's personnel incurred in connection with the Work;

8.3.1.3.5 cost of all materials, supplies, and equipment incorporated in the Work, including costs of inspection and testing if not provided by the Owner, transportation, storage, and handling;

8.3.1.3.6 payments made by the Trade Contractor to Subcontractors for Work performed under this Agreement;

8.3.1.3.7 cost, including transportation and maintenance of all materials, supplies, equipment, temporary facilities, and hand tools not owned by the workers that are used or consumed in the performance of the Work, less salvage value or residual value; and cost less salvage value of such items used, but not consumed that remain the property of the Trade Contractor;

8.3.1.3.8 rental charges of all necessary machinery and equipment, exclusive of hand tools owned by workers, used at the Worksite, whether rented from the Trade Contractor or Others, including installation, repair and replacement, dismantling, removal, maintenance, transportation, and delivery costs. Rental from unrelated third parties shall be reimbursed at actual cost. Rentals from the Trade Contractor or its affiliates, subsidiaries, or related parties shall be reimbursed at the prevailing rates in the locality of the Worksite up to eighty-five percent (85%) of the value of the piece of equipment;

8.3.1.3.9 cost of the premiums for all insurance and surety bonds which the Trade Contractor is

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required to procure or deems necessary, and approved by the Owner including any additional premium incurred as a result of any increase in the cost of the Work;

8.3.1.3.10 sales, use, gross receipts or other taxes, tariffs, or duties related to the Work for which the Trade Contractor is liable;

8.3.1.3.11 permits, fees, licenses, tests, and royalties;

8.3.1.3.12 reproduction costs, photographs, facsimile transmissions, long-distance telephone calls, data processing costs and services, postage, express delivery charges, data transmission, telephone service, and computer-related costs at the Worksite to the extent such items are used and consumed in the performance of the Work or are not capable of use after completion of the Work;

8.3.1.3.13 all water, power, and fuel costs necessary for the Work;

8.3.1.3.14 cost of removal of all nonhazardous substances, debris, and waste materials;

8.3.1.3.15 all costs directly incurred to perform a change in the Work which are reasonably inferable from the Contract Documents for the Changed Work;

8.3.1.3.16 DISCOUNTS All discounts for prompt payment shall accrue to the Owner to the extent such payments are made directly by the Owner. To the extent payments are made with funds of the Constructor, all cash discounts shall accrue to the Constructor. All trade discounts, rebates and refunds, and all returns from sale of surplus materials and equipment, shall be credited to the Cost of the Work;

8.3.1.3.17 COST REPORTING The Trade Contractor shall maintain in conformance with generally accepted accounting principles a complete and current set of records that are prepared or used by the Trade Contractor to calculate the Cost of Work. The Owner and Construction Manager shall be afforded access to the Trade Contractor's records, books, correspondence, instructions, drawings, receipts, vouchers, memoranda and similar data relating to requested payment for Cost of the Work. The Trade Contractor shall preserve all such records for a period of three years after the final payment or longer where required by law;

8.3.1.3.18 COST AND SCHEDULE ESTIMATES The Trade Contractor shall use reasonable skill and judgment in the preparation of a cost estimate or schedule for a change to the Work, but does not warrant or guarantee their accuracy

8.3.1.4 If an increase or decrease cannot be agreed to as set forth in Clauses .1 through .3 above, and the Owner or the Construction Manager issues a Trade Contract Interim Directed Change, the cost of the change in the Trade Contract Work shall be determined by the reasonable actual expense and savings of the performance of the Work resulting from the change. If there is a net increase in the Trade Contract Price, the Trade Contractor's Fee shall be adjusted accordingly. In case of a net decrease in the Trade Contract Price, the Trade Contractor's Fee shall not be adjusted unless ten percent (10%) or more of the Project is deleted. The Trade Contractor shall maintain a documented, itemized accounting evidencing the expenses and savings.

8.3.2 If unit prices are set forth in the Trade Contract Documents or are subsequently agreed to by the Parties, but the character or quantity of such unit items as originally contemplated is so different in a proposed Trade Change Order that the original unit prices will cause substantial inequity to the Owner or the Trade Contractor, such unit prices shall be equitably adjusted.

8.4 CLAIMS FOR ADDITIONAL COST OR TIME Except as provided in subsection 6.3.2 and section 6.4 for

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any claim for an increase in the Trade Contract Price or the Trade Contract Time, the Trade Contractor shall give the Owner and the Construction Manager written notice of the claim within fourteen (14) Days after the occurrence giving rise to the claim or within fourteen (14) Days after the Trade Contractor first recognizes (or should have recognized) the condition giving rise to the claim, whichever is later. Except in an emergency, notice shall be given before proceeding with the Trade Contract Work. Thereafter, the Trade Contractor shall submit written documentation of its claim, including appropriate supporting documentation, within twenty-one (21) Days after giving notice, unless the Parties mutually agree upon a period of time. The Owner or Construction Manager shall respond in writing denying or approving the Trade Contractor's claim no later than fourteen (14) Days after receipt of the Trade Contractor's claim. Any change in the Trade Contract Price or the Trade Contract Time resulting from such claim shall be authorized by Trade Contract Change Order.

ARTICLE 9 PAYMENT

9.1 GENERAL PROVISIONS Within fourteen (14) calendar Days from the date of execution of this Agreement, the Trade Contractor shall prepare and submit to the Construction Manager for approval a Schedule of Values apportioned to the various divisions or phases of the Trade Contract Work. Each line item contained in the Schedule of Values shall be assigned a monetary price such that the total of all such items shall equal the Trade Contract Price. The Schedule of Values shall be prepared in such detail and be supported by such documents and proof as may be required by the Construction Manager.

9.2 PROGRESS PAYMENTS

9.2.1 APPLICATIONS The Trade Contractor shall submit to the Construction Manager monthly notarized applications for payment. Trade Contractor's applications for payment shall be itemized and supported by the Trade Contractor's Schedule of Values and any other substantiating data as required by this Trade Contractor Agreement or requested by the Construction Manager or Design Professional. Payment applications may include payment requests on account of properly authorized Trade Contract Change Orders and Interim Directed Changes. The progress payment application shall include Trade Contract Work performed through the preceding calendar month. The Construction Manager will review the application and recommend to the Design professional and the Owner amounts payable by the Owner to the Trade Contractor. The Owner, in accordance with the determination of the Design Professional, shall pay the amount otherwise due on any payment application, less any amounts as set forth below, no later than thirty (30) calendar Days after the payment application, or portion thereof, is approved the Design Professional. The Owner may deduct, from any progress payment, such amounts as may be retained pursuant to subsection 9.2.4 below.

9.2.2 STORED MATERIALS AND EQUIPMENT Unless otherwise provided in the contract documents, applications for payment may include materials and equipment not yet incorporated into the Work but delivered to and suitably stored onsite or offsite including applicable insurance, storage and costs incurred transporting the materials to an offsite storage facility. Approval of payment applications for stored materials and equipment stored offsite shall be conditioned on submission by the Trade Contractor of bills of sale and proof of required insurance, or such other procedures satisfactory to the Owner to establish the proper valuation of the stored materials and equipment, the Owner's title to such materials and equipment, and to otherwise protect the Owner's interests therein, including transportation to the site.

9.2.3 CLAIM WAIVERS

9.2.3.1 PARTIAL CLAIMWAIVERS AND AFFIDAVITS As a prerequisite for payment, the Trade Contractor shall provide, in a form satisfactory to the Owner and the Construction Manager, partial claim waivers in the amount of the application for payment and affidavits from the Trade Contractor, and its Subcontractors, Material Suppliers for the completed Trade Contract Work.

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Such waivers shall be effective upon payment. In no event shall the Trade Contractor be required to sign an unconditional waiver of claim, either partial or final, prior to receiving payment or in an amount in excess of what it has been paid.

9.2.4 RETAINAGE From each progress payment made to the Trade Contractor has the Owner shall retain FIVE (5) percent of the amount otherwise due after deduction of any amounts as provided in section 9.3 and in no event shall such percentage exceed any applicable statutory requirements of this Agreement. Retainage shall be withheld and administered in accordance with Iowa Code Chapter 572:

9.3 ADJUSTMENT OF TRADE CONTRACTOR'S PAYMENT APPLICATION The Owner or the Construction Manager, upon notification of the Design Professional, may reject or adjust a Trade Contractor payment application or nullify a previously approved Trade Contractor payment application, in whole or in part, as may reasonably be necessary to protect the Owner from loss or damage based upon the following, to the extent that the Trade Contractor is responsible therefor under this Trade Contractor Agreement:

9.3.1 the Trade Contractor's repeated failure to perform the Trade Contract Work as required by the Trade Contractor Agreement;

9.3.2 loss or damage arising out of or relating to the Trade Contractor Agreement and caused by the Trade Contractor to the Owner, or to the Construction Manager or others to whom the Owner may be liable;

9.3.3 the Trade Contractor's failure to properly pay for labor, materials, equipment or supplies furnished in connection with the Trade Contract Work;

9.3.4 nonconforming or defective Trade Contract Work which has not been corrected in a timely fashion;

9.3.5 reasonable evidence of delay in performance of the Trade Contract Work such that the work will not be completed within the Trade Contract Time, and that the unpaid balance of the Trade Contract Price is not sufficient to offset any liquidated damages or actual damages that may be sustained by the Owner as a result of the anticipated delay caused by the Trade Contractor;

9.3.6 reasonable evidence demonstrating that the unpaid balance of the Trade Contract Price is insufficient to cover the cost to complete the Trade Contract Work; and

9.3.7 third-party claims involving the Trade Contractor or reasonable evidence demonstrating that third-party claims are likely to be filed unless and until the Trade Contractor furnishes the Owner with adequate security in the form of a surety bond, letter of credit or other collateral or commitment which are sufficient to discharge such claims if established. No later than thirty (30) Days after receipt of an application for payment, the Owner or Construction Manager shall give written notice to the Trade Contractor, disapproving or nullifying it or a portion thereof, specifying the reasons for the disapproval or nullification. When the above reasons for disapproving or nullifying an application for payment are removed, payment will be made for amounts previously withheld.

9.4 PAYMENT NOT ACCEPTANCE Payment to the Trade Contractor does not constitute or imply acceptance of any portion of the Trade Contract Work.

9.5 PAYMENT DELAY If for any reason not the fault of the Trade Contractor, the Trade Contractor does not receive a progress payment from the Owner sixty (60) calendar Days after the time such payment is due, as defined in Subparagraph 9.2.1, then the Trade Contractor, upon giving within seven (7) calendar Days after written notice to the Owner, and without prejudice to and in addition to any other legal remedies, may stop its Trade Contract Work until payment of the full amount owing to the Trade Contractor has been received. The

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Trade Contract Price and Trade Contract Time shall be equitably adjusted by a Trade Contract Change Order to reflect reasonable cost and delay resulting from shutdown, delay and start-up.

9.6 SUBSTANTIAL COMPLETION

9.6.1 The Trade Contractor shall notify the Owner, the Construction Manager and the Design Professional when it considers Substantial Completion of the Trade Contract Work or a designated portion to have been achieved. The Construction Manager and the Design Professional shall promptly conduct an inspection to determine whether the Trade Contract Work or designated portion can be occupied or utilized for its intended use by the Owner without excessive interference in completing any remaining unfinished Trade Contract Work by the Trade Contractor. If the Construction Manager and the Design Professional determine that the Trade Contract Work or designated portion has not reached Substantial Completion, the Design Professional, and the Construction Manager, shall promptly compile a list of items to be completed or corrected so the Owner may occupy or utilize the Trade Contract Work or designated portion for its intended use. The Trade Contractor shall promptly complete all items on the list.

9.6.2 When Substantial Completion of the Trade Contract Work or a designated portion is achieved, the Construction Manager and the Design Professional shall prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion, and the respective responsibilities of the Owner and Trade Contractor for interim items such as security, maintenance, utilities, insurance and damage to the Trade Contract Work. The Owner shall assume all responsibilities for items such as security, maintenance, utilities, and insurance, and damage to the Work. The certificate shall also list the items to be completed or corrected, and establish the time for their completion or correction. The Certificate of Substantial Completion shall be submitted to the Trade Contractor for written acceptance of responsibilities assigned in the Certificate.

9.6.3 Unless otherwise provided in the Certificate of Substantial Completion, warranties required by the Trade Contract Documents shall commence on the date of Substantial Completion of the Trade Contract Work or a designated portion.

9.6.4 Uncompleted items shall be completed by the Trade Contractor by the Final Completion date set forth in the Agreement and/or Construction Schedule. The Trade Contractor may request early release of retainage in accordance with Iowa Code Section 26.13. Payment for completed work and retainage shall be made in accordance with Iowa Code Chapters 26 and 573.

9.7 PARTIAL OCCUPANCY OR USE The Owner may occupy or use completed or partially completed portions of the Trade Contract Work when (a) the portion of the Trade Contract Work is designated in a Certificate of Substantial Completion, (b) appropriate insurer(s) consent to the occupancy or use, and (c) appropriate public authorities authorize the occupancy or use. Such partial occupancy or use shall constitute Substantial Completion of that portion of the Trade Contract Work.

9.8 FINAL PAYMENT

9.8.1 APPLICATION Upon acceptance of the Trade Contract Work by the Construction Manager, and approval by the Design Professional, and upon the Trade Contractor furnishing evidence of fulfillment of the Trade Contractor's obligations in accordance with the Trade Contract Documents, the Trade Contractor shall submit its application for final payment. The Construction Manager will review the Trade Contractor's final payment application and recommend to the Design Professional and the Owner an amount payable by the Owner to the Trade Contractor. The Design Professional shall then recommend an amount to be paid by the Owner. Final payment shall be made in accordance with Iowa Code Chapters 26 and 573.

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9.8.2 REQUIREMENTS Along with its application for final payment, the Trade Contractor shall furnish to the Construction Manager:

9.8.2.1 an affidavit that all payrolls, bills for materials and equipment, and other indebtedness connected with the Trade Contract Work for which the Owner or its property or the Construction Manager or the Owner's surety might in any way be liable, have been paid or otherwise satisfied;

9.8.2.2 consent of the Trade Contractor's surety to final payment;

9.8.2.3 satisfaction of closeout procedures as may be required by the Trade Contractor Agreement;

9.8.2.4 certification(or other writing indicating) that insurance required by the Trade Contractor Agreement is and will remain effect beyond final payment pursuant to this Trade Contractor Agreement and

9.8.2.5 other data if required by the Owner or Construction Manager, such as receipts, releases, and waivers of liens effective upon payment to the extent and in such form as may be designated by the Owner or Construction Manager. Acceptance of final payment by the Trade Contractor shall constitute a waiver of all claims by the Trade Contractor except those previously made in writing and identified by the Trade Contractor as unsettled at the time of final application for payment.

9.8.3 TIME OF PAYMENT Final payment of the balance of the Trade Contract Price, less any amount retained pursuant to subsection 9.2.4 of this Agreement, and as required by Iowa Code Chapters 26 and 573, which among other things requires that twice the amount of an Iowa Code Chapter 573 subcontractor claim be withheld from final payment, shall be made to the Trade contractor within sixty (60) Days after the Trade Contractor has submitted a complete and accurate application for final payment.

9.8.4 LATE PAYMENT INTEREST Progress payments or final payment due and unpaid under this Trade Contractor Agreement shall bear interest from the date payment is due at the statutory rate prevailing at the place of the Project.

9.9 PAYMENT USE AND VERIFICATION The Trade Contractor is required to pay for all labor, materials and equipment used in the performance of the Trade Contract Work through the most current period applicable to progress payments received. Reasonable evidence, satisfactory to the Construction Manager, may be required to show that all obligations relating to the Trade Contract Work are current before releasing any payment due on the Trade Contract Work. If required by the Construction Manager, before final payment is made for the Trade Contract Work, the Trade Contractor shall submit evidence satisfactory to the Construction Manager that all payrolls, bills for materials and equipment, and all known indebtedness connected with the Trade Contract Work, have been paid or otherwise satisfied as set forth in subsection 9.8.2.

ARTICLE 10 INDEMNITY, INSURANCE, WAIVERS AND BONDS

10.1 INDEMNITY

10.1A To the extent portions of this Article are in conflict with SF 396 (codified at Iowa Code Section 573A.5) said portions are void and unenforceable.

10.1.1 TRADE CONTRACTOR'S INDEMNITY To the fullest extent permitted by law, the Trade Contractor shall indemnify and hold harmless the Owner, the Owner's officers, directors, members,

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consultants, agents and employees, from all claims for bodily injury and property damage, other than to the Work itself and other property insured under subsection 10.3.1, including reasonable attorneys' fees, costs and expenses, that may arise from the performance of the Work, but only to the extent caused by the negligent acts or omissions of the Trade Contractor, Subcontractors or anyone employed directly or indirectly by any of them or by anyone for whose acts any of them may be liable. The Trade Contractor shall be entitled to reimbursement of any defense costs paid above the Trade Contractor's percentage of liability for the underlying claim to the extent provided for under subsection 10.1.2.

10.1.2 OWNER'S INDEMNITY To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Trade Contractor, its officers, directors, members, consultants, agents, and employees, from all claims for bodily injury and property damage, other than property insured under subsection 10.3.1, including reasonable attorneys' fees, costs and expenses, that may arise from the performance of work by Owner, Design Professional or Others, but only to the extent caused by the negligent acts or omissions of the Owner, Design Professional or Others. The Owner shall be entitled to reimbursement of any defense costs paid above Owner's percentage of liability for the underlying claim to the extent provided for under subsection 10.1.1.

10.1.3 CONSTRUCTION MANAGER AND DESIGN PROFESSIONAL INDEMNITY The Owner shall cause the Construction Manager and the Design Professional to agree to indemnify and hold harmless the Owner from all claims for bodily injury and property damage, other than to the Work itself and other property insured under section 10.3, that may arise from the Construction Manager's or the Design Professional's services, but only to the extent that such claims result from the negligent acts or omissions of the Construction Manager or the Design Professional, respectively, or anyone for whose acts or omissions the Construction Manager or Design Professional, respectively, is liable. Such provisions shall be in a form no less protective of the Parties than the Construction Manager's Indemnity provided in ConsensusDocs 801 (2011) or the Design Professional's indemnity provided in ConsensusDocs 803 (2011) respectively, and shall be reasonably satisfactory to the Owner and the Trade Contractor.

10.1.4 ADJACENT PROPERTY INDEMNIFICATION To the extent of the limits of Trade Contractor's Commercial General Liability Insurance specified in subsection 10.2.1 or Zero Dollars and No Cents ($0.00) whichever is more, the Trade Contractor shall indemnify and hold harmless the Owner against any and all liability, claims, demands, damages, losses and expenses, including attorney's fees, in connection with or arising out of any damage or alleged damage to any of Owner's existing adjacent property that may arise from the performance of the Trade Contract Work, but only to the extent of the negligent acts or omissions of the Trade Contractor, Subcontractor or anyone employed directly or indirectly by any of them or by anyone for whose acts any of them may be liable.

10.1.5 NO LIMITATION ON LIABILITY In any and all claims against the Indemnitees by any employee of the Trade Contractor, anyone directly or indirectly employed by the Trade Contractor or anyone for whose acts the Trade Contractor may be liable, the indemnification obligation shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Trade Contractor under Workers' Compensation acts, disability benefit acts or other employment benefit acts.

10.2 TRADE CONTRACTOR'S INSURANCE

10.2.1 Prior to the start of the Work, the Trade Contractor shall procure and maintain in force Workers Compensation/Employers' Liability Insurance, Business Automobile Liability Insurance, and Commercial General Liability Insurance (CGL). The CGL policy shall include coverage for liability arising from premises, operations, independent contractors, products-completed operations, personal injury and

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advertising injury, contractual liability, and broad form property damage. The Trade Contractor's liability policies, as required in this Subparagraph 10.2.1, shall be written on an occurrence basis with at least the following limits of liability:

10.2.1.1 Workers' Compensation- amount required by the laws of Iowa

10.2.1.2 Employers' Liability Insurance - $500,000 or an amount required by Iowa law, whichever is greater.

10.2.1.3 Business Automobile Liability Insurance

a. $1,000,000 Each Accident

10.2.1.4 Commercial General Liability Insurance

a. $1,000,000 Each Occurrence b. $2,000,000 General Aggregate c. $1,000,000 Products/Completed Operations Aggregate d. $1,000,000 Personal and Advertising Injury Limit

10.2.2 The Trade Contractor Must also carry and maintain Excess or Umbrella Liability coverage for the policies in subsection 10.2.1 in the amounts as listed below:

Trade Contractor Contract Amount: <$1,000,000 - $2 Million Umbrella or more $1,000,000 - $5,000,000 - $5 Million Umbrella or more >$5,000,000 - $10 Million Umbrella or more

10.2.3 The Trade Contractor shall maintain in effect all insurance coverage required under subsection 10.2.1 with insurance companies lawfully authorized to do business in Iowa. Such insurance companies shall have a minimum A.M. Best Rating of A-VI (Consult instructions and insurance advisor).If the Trade Contractor fails to obtain or maintain any insurance coverage required under this Agreement, the Owner may purchase such coverage and charge the expense to the Trade Contractor, or terminate this Agreement.

10.2.4 To the extent commercially available, the policies of insurance required under Subparagraph 10.2.1 shall contain a provision that the insurance company or its designee must give the Owner written notice transmitted in paper or electronic format: (a) 30 days before coverage is nonrenewed by the insurance company and (b) with 10 business days after cancelation of coverage by the insurance company. The Trade Contractor shall maintain completed operations liability insurance for one year after acceptance of the Contract Documents, whichever is longer. Prior to commencement of services, the Trade Contract shall furnish the Owner with certificates evidencing the required coverages. In addition, if any insurance policy required under subsection 10.2.1 is not to be immediately replaced without a lapse in coverage when it expires, exhausts its limits, or is to be, cancelled, the Trade Contractor shall give Owner prompt written notice upon actual or constructive knowledge of such condition.

10.2.5 ADDITIONAL LIABILITY COVERAGE

10.2.5.1 The Owner [X] shall / [ ] shall not (indicate one) require the Trade Contractor to purchase and maintain liability coverage, primary to the Owner's coverage under subsection 10.3.1.

10.2.5.2 If required by subsection 10.2.5.1, the additional liability coverage required of the Trade Contractor shall be:

1. Additional Insured Owner shall be named as an additional insured on Trade Contractor's Commercial General Liability Insurance specified for operations and completed operations,

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but only with respect to liability for bodily injury, property damage or personal and advertising injury to the extent caused by the negligent acts or omissions of Trade Contractor, or those acting on Trade Contractor's behalf, in the performance of Trade Contractor's Work for.

2. OCP Trade Contractor shall provide an Owners' and Contractors' Protective Liability Insurance ("OCP") policy with limits equal to the limits on Commercial General Liability Insurance specified or limits as otherwise required by Owner.

Any documented additional cost in the form of a surcharge associated with procuring the additional liability coverage in accordance with this subsection shall be paid by the Owner directly or the costs may be reimbursed by the Owner to the Trade Contractor by increasing the Trade Contract Price to correspond to the actual cost required to purchase and maintain the additional liability coverage. Prior to commencement of the Work, the Trade Contractor shall obtain and furnish to the Owner a certificate evidencing that the additional liability coverages have been procured.

10.2.6 PROFESSIONAL LIABILITY INSURANCE To the extent the Trade Contractor is required to procure design services under this Agreement, in accordance with section 3.14, the Trade Contractor shall require the designers to obtain professional liability insurance for claims arising from the negligent performance of professional services under this Agreement, with a company reasonably satisfactory to the Owner, including coverage for all professional liability caused by any of the Designer's(s') consultants, written for not less than $1,000,000 per claim and in the aggregate with the deductible not to exceed $2,000,000. The deductible shall be paid by the Designer.

10.3 OWNER'S INSURANCE

10.3.1 Deleted.

10.3.2 Deleted.

10.4 PROPERTY INSURANCE

10.4.1 Before the start of Trade Contract Work, the Owner shall obtain and maintain Builder's Risk Policy insurance with minimum coverage limits equal to the full cost of replacement of the Project at the time of loss. This insurance shall also name the Trade Contractor, Subcontractors, Material Suppliers, Construction Manager and Design Professional as insureds. This insurance shall be written as a Builder's Risk Policy or equivalent form to cover all risks of physical loss except those specifically excluded by the policy, and shall insure at least against the perils of fire, lightning, explosion, windstorm, hail, smoke, aircraft and vehicles, riot and civil commotion, theft, vandalism, malicious mischief, debris removal, flood (subject to sublimits), earthquake (subject to sublimits), earth movement, water damage, wind damage, testing if applicable, collapse however caused, and shall include coverage for, material, or equipment stored offsite, onsite or in transit. This policy shall provide for a waiver of subrogation in favor of the Trade Contractor, Subcontractors, Material Suppliers, Construction Manager and Design Professional. This insurance shall remain in effect until the Substantial Completion of the Work, final payment has been made or until no person or entity other than the Owner has an insurable interest in the property to be covered by this insurance, whichever is sooner. Partial occupancy or use of the Work shall not commence until the Owner has secured the consent of the insurance company or companies providing the coverage required in this Subparagraph 10.4.1.

10.4.2 If the Owner does not intend to purchase the property insurance required by this Agreement, including all of the coverages and deductibles described herein, the Owner shall give written notice to the Trade Contractor, the Design Professional and the Construction Manager before the Trade Contract

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Work is commenced. The Trade Contractor may then provide insurance to protect its interests and the interests of the Subcontractors, including the coverage of deductibles. The cost of this insurance shall be charged to the Owner in a Change Order. The Owner shall be responsible for all of Trade Contractor's costs reasonably attributed to the Owner's failure or neglect in purchasing or maintaining the coverage described above.

10.4.2.1 The Owner will not obtain insurance to cover the risk of physical loss resulting from Terrorism. The Construction Manager is not required to purchase this type of insurance but may purchase this type of insurance if it chooses. f purchased, the cost of this insurance shall be borne by the Construction manager.

10.4.3 POLICIES The Owner shall provide the Trade Contractor with a copy of all policies including all endorsements upon request.

10.5 PROPERTY INSURANCE LOSS ADJUSTMENT

10.5.1 LOSS ADJUSTMENT Any insured loss shall be adjusted with the Owner and the Trade Contractor and made payable to the Owner as trustee for the insureds, as their interests may appear.

10.5.2 DISTRIBUTION OF PROCEEDS Following the occurrence of an insured loss, monies received will be deposited in a separate account and the trustee shall make distribution in accordance with the agreement of the Parties in interest.

10.6 WAIVERS

10.6.1 PROPERTY DAMAGE The Owner and Trade Contractor waive all claims and other rights they may have against each other for loss of or damage to (a) the Project, (b) all materials, machinery, equipment and other items used in accomplishing the Trade Contract Work or services or to be incorporated into the Project, while the same are in transit, at the Project Site, during erection and otherwise, and (c) all property owned by or in the custody of Owner and its affiliates, however such loss or damage shall occur, to be extent such damage is covered by property insurance. The proceeds of such insurance shall be held by the Owner as trustee.

10.6.2 WAIVER OF SUBROGATION The Owner shall have its insurers waive all rights of subrogation they may have against the Construction Manager, Design Professional, Trade Contractors, and their Subcontractors and Material Suppliers on all policies carried by the Owner on the Project and adjacent properties, including, after final payment, those policies to be provided on the completed Project not intended to insure the Project during construction.

10.6.3 ENDORSEMENT If the policies of insurance referred to in this section require an endorsement to provide for continued coverage where there is a waiver of subrogation, the Owner will cause them to be so endorsed.

10.7 RISK OF LOSS Except to the extent a loss is covered by propertyinsurance,carried by the owner, risk of loss or damage to the Work shall be upon the Trade Contractor until the Date of Final Completion, unless otherwise agreed to by the Parties.

10.8 BONDS Performance and Payment Bonds

☒ are

☐ are not

required of the Trade Contractor that meet the requirements of Iowa Code Chapter 573. A deposit in lieu of a

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bond may be acceptable if it meets the requirements of Iowa Code Section 573.4. Such bonds shall be issued by a surety admitted in the State in which the Project is located and must be acceptable to the Owner. The Owner's acceptance shall not be withheld without reasonable cause. The penal sum of the Payment Bond and of the Performance Bond shall each be one hundred percent (100%) of the original Contract Price. Any increase in the Contract Price that exceeds ten percent (10%) in the aggregate shall require a rider to the Bonds increasing penal sums accordingly. Up to such ten percent (10%) amount, the penal sum of the Bond shall remain equal to one hundred percent (100%) of the Contract Price. The Trade Contractor shall endeavor to keep its surety advised of changes potentially impacting the Contract Time and Contract Price, though the Trade Contractor shall require that its surety waives any requirement to be notified of any alteration or extension of time. The Trade Contractor's Payment Bond for the Project, if any, shall be made available by the Owner for review and copying by the Subcontractor. Iowa Code Chapter 573 shall control and take precedence over any conflicting term or condition in this Agreement

ARTICLE 11 SUSPENSION, NOTICE TO CURE AND TERMINATION OF AGREEMENT

11.1 SUSPENSION BY OWNER FOR CONVENIENCE

11.1.1 OWNER SUSPENSION Should the Owner order the Trade Contractor in writing to suspend, delay, or interrupt the performance of the Trade Contract Work for such period of time as may be determined to be appropriate for the convenience of the Owner and not due to any act or omission of the Trade Contractor or any person or entity for whose acts or omissions the Trade Contractor may be liable, then the Trade Contractor shall immediately suspend, delay or interrupt that portion of the Trade Contract Work as ordered by the Owner. The Trade Contract Price and the Trade Contract Time shall be equitably adjusted by Trade Contract Change Order for the cost and delay resulting from any such suspension.

11.1.2 Any action taken by the Owner that is permitted by any other provision of the Trade Contract Documents and that results in a suspension of part or all of the Trade Contract Work does not constitute a suspension of Trade Contract Work under this section.

11.2 NOTICE TO CURE A DEFAULT If the Trade Contractor persistently refuses or fails to supply enough properly skilled workers, proper materials, or equipment to maintain the approved Construction Schedule in accordance with ARTICLE 6, or fails to make prompt payment to its workers, Subcontractors or Material Suppliers; disregards laws, ordinances, rules, regulations or orders of any public authority having jurisdiction; or is otherwise guilty of a material breach of a provision of this Agreement, the Trade Contractor may be deemed in default. If the Trade Contractor fails within seven (7) business Days after receipt of written notification to commence and continue satisfactory correction of such default with diligence and promptness, then the Owner shall give the Trade Contractor a second notice to correct the default within a three (3) Day period. If the Trade Contractor fails to promptly commence and continue satisfactory correction of the default following receipt of such second notice, the Owner without prejudice to any other rights or remedies may:

11.2.1 supply workers and materials, equipment and other facilities as the Owner or Construction Manager deems necessary for the satisfactory correction of the default, and charge the cost to the Trade Contractor, who shall be liable for the payment of same including reasonable Overhead, profit and attorneys' fees;

11.2.2 contract with Others to perform such part of the Trade Contract Work as the Owner or Construction Manager determines shall provide the most expeditious correction of the default, and charge the cost to the Trade Contractor;

11.2.3 withhold payment due the Trade Contractor in accordance with section 9.3; and

11.2.4 in the event of an emergency affecting the safety of persons or property, immediately commence

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and continue satisfactory correction of such default as provided in subsections 11.2.1 and 11.2.2 without first giving written notice to the Trade Contractor, but shall give prompt written notice of such action to the Trade Contractor following commencement of the action.

11.3 OWNER'S RIGHT TO TERMINATE FOR DEFAULT

11.3.1 TERMINATION BY OWNER FOR DEFAULT If, within seven (7) Days of receipt of a notice to cure pursuant to section 11.2, the Trade Contractor fails to commence and satisfactorily continue correction of the default set forth in the notice to cure, the Owner may notify the Trade Contractor that it intends to terminate this Agreement for default absent appropriate corrective action within fourteen additional Days. After the expiration of the additional fourteen (14) Day period, the Owner may terminate this Agreement by written notice absent appropriate corrective action. Termination for default is in addition to any other remedies available to Owner under section 11.2. If the Owner's cost arising out of the Trade Contractor's failure to cure, including the cost of completing the Trade Contract Work and reasonable attorneys' fees, exceeds the unpaid Trade Contract Price, the Trade Contractor shall be liable to the Owner for such excess costs. If the Owner's costs are less than the unpaid Trade Contract Price, the Owner shall pay the difference to the Trade Contractor. In the event the Owner exercises its rights under this section, upon the request of the Trade Contractor the Owner shall furnish to the Trade Contractor a detailed accounting of the cost incurred by the Owner.

11.3.2 USE OF TRADE CONTRACTOR'S MATERIALS, SUPPLIES AND EQUIPMENT If the Owner or Others perform work under this section, the Owner shall have the right to take and use any materials, supplies and equipment belonging to the Trade Contractor and located at the Worksite for the purpose of completing any remaining Trade Contract Work. Immediately upon completion of the Work, any remaining materials, supplies or equipment not consumed or incorporated in the Trade Contract Work shall be returned to the Trade Contractor in substantially the same condition as when they were taken, reasonable wear and tear excepted.

11.3.3 If the Trade Contractor files a petition under the Bankruptcy Code, this Agreement may be terminated for cause at the may be terminated for cause at the Owner.

11.3.3 If the Trade Contractor files a petition under the Bankruptcy Code, this Agreement may be terminated for cause at the may be terminated for cause at the Owner.

11.3.4 The Owner shall make reasonable efforts to mitigate damages arising from Trade Contractor default, and shall promptly invoice the Trade Contractor for all amounts due pursuant to sections 11.2 and 11.3.

11.4 TERMINATION BY OWNER FOR CONVENIENCE

11.4.1 Upon written notice to the Trade Contractor, the Owner may, without cause, terminate this Agreement. The Trade Contractor shall immediately stop the Work, follow the Owner's or Construction Manager's instructions regarding shutdown and termination procedures, and strive to minimize any further costs.

11.4.2 If the Owner terminates this Agreement pursuant to this section, the Trade Contractor shall be paid:

11.4.2.1 for the Work performed to date including Overhead and profit; and

11.4.2.2 for all demobilization costs and costs incurred as a result of the termination but not including Overhead or profit on work not performed;

11.4.2A Upon written notice to the Trade Contractor the Owner has the right to terminate this

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Agreement without penalty as a result of the following: 1) the legislature or governor fail to appropriate funds sufficient to allow the Owner to operate as required and fulfill its obligations under this Agreement, 2) funds are de-appropriated or not allocated, 3) the Owner's authorization to operate is withdrawn or there is a material alteration in the programs administered by the owner, or 4) the Owner's duties are substantially modified. If such a termination results then the Trade Contractor shall be paid in the manner set forth in subparagraph 11.4.2. If, however, an appropriation to cover the cost of this Agreement becomes available within sixty (60) days subsequent to termination under this paragraph then the Owner agrees to re-enter into a modified version of this Agreement that accounts for the termination and reinstatement.

11.4.3 If the Owner terminates this Agreement pursuant to sections 11.3 or 11.4, the Trade Contractor shall:

11.4.3 If the Owner terminates this Agreement pursuant to sections 11.3 or 11.4, the Trade Contractor shall:

11.4.3.1 execute and deliver to the Owner all papers and take all action required to assign, transfer and vest in the Owner the rights of the Trade Contractor to all materials, supplies and equipment for which payment has or will be made in accordance with the Trade Contract Documents and all subcontracts, orders and commitments which have been made in accordance with the Trade Contract Documents;

11.4.3.2 exert reasonable effort to reduce to a minimum the Owner's liability for subcontracts, orders and commitments that have not been fulfilled at the time of the termination;

11.4.3.3 cancel any subcontracts, orders and commitments as the Owner or Construction Manager directs; and

11.4.3.4 sell at prices approved by the Owner or Construction Manager any materials, supplies and equipment as the Owner or Construction Manager directs, with all proceeds paid or credited to the Owner.

11.5 TRADE CONTRACTOR'S RIGHT TO TERMINATE

11.5.1 Upon seven (7) Days' written notice to the Owner and Construction Manager, the Trade Contractor may terminate this Agreement if the Trade Contract Work has been stopped for a thirty (30) Day period through no fault of the Trade Contractor for any of the following reasons:

11.5.1.1 under court order or order of other governmental authorities having jurisdiction;

11.5.1.2 as a result of the declaration of a national emergency or other governmental act during which, through no act or fault of the Trade Contractor, materials are not available; or

11.5.1.3 suspension by the Owner for convenience pursuant to section 11.1

11.5.2 In addition, upon seven (7) Days' written notice to the Owner and Construction Manager, the Trade Contractor may terminate the Agreement if the Owner:

11.5.2.1 fails to furnish reasonable evidence pursuant to section 4.1.2 that sufficient funds are available and committed for Project financing, or

11.5.2.2 assigns this Agreement over the Trade Contractor's reasonable objection, or

11.5.2.3 fails to pay the Trade Contractor in accordance with this Agreement and the Trade Contractor has complied with the notice provisions of section 9.5, or

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11.5.2.4 otherwise materially breaches this Agreement.

11.5.3 Upon termination by the Trade Contractor in accordance with this section, the Trade Contractor shall be entitled to recover from the Owner payment for all Trade Contract Work executed and for any proven loss, cost or expense in connection with the Trade Contract Work, including all demobilization costs plus reasonable Overhead and profit on work not performed.

11.6 OBLIGATIONS ARISING BEFORE TERMINATION Even after termination pursuant to ARTICLE 11, the provisions of this Agreement still apply to any Trade Contract Work performed, payments made, events occurring, costs charged or incurred or obligations arising before the termination date.

ARTICLE 12 DISPUTE MITIGATION AND RESOLUTION

12.1 WORK CONTINUANCE AND PAYMENT Unless otherwise agreed in writing, the Trade Contractor shall continue the Trade Contract Work and maintain the Construction Schedule during any dispute mitigation or resolution proceedings. If the Trade Contractor continues to perform, the Owner shall continue to make payments in accordance with this Agreement.

12.2 DIRECT DISCUSSIONS If the Parties cannot reach resolution on a matter relating to or arising out of the Agreement, the Parties shall endeavor to reach resolution through good faith direct discussions between the Parties' representatives, who shall possess the necessary authority to resolve such matter and who shall record the date of first discussions. The authorized representative for the Trade Contractor is identified in Paragraph 3.4 of the Agreement. The authorized representative for the Owner is identified in Paragraph 4.2 of the Agreement. The parties' authorized representative are, among other things, authorized to resolve matters of disagreement and disputes between the Parties. If the dispute remains unresolved after fifteen (15) Days from the date of first discussion, the Parties shall submit such matter to the dispute mitigation and dispute resolution procedures selected herein.

12.3 MITIGATION The Parties agree that dispute mitigation procedures provided in this Project. Disputes remaining unresolved after direct discussions shall be directed to the selected mitigation procedure immediately below. The dispute mitigation procedure shall result in nonbinding finding on the matter. This may be introduced as evidence at a subsequent binding adjudication of the matter, as designee on Paragraph 12.5. The Parties agree that the dispute mitigation procedure shall be

(Designate only one.)

[X] Project Neutral

[ ] Dispute Review Board

12.3.1 MITIGATION PROCEDURES The Project Neutral/Dispute Review Board shall be mutually selected and appointed by the Parties and shall execute a retainer agreement with the Parties establishing the scope of the Project Neutral/Dispute Review Board's responsibilities. The costs and expenses of the Project Neutral/Dispute Review Board shall be shared equally by the Parties. The Project Neutral/Dispute Review Board shall be available to either Party, upon request, throughout the course of the Project, and shall make regular visits to the Project so as to maintain an up-to-date understanding of the Project progress and issues and to enable the Project Neutral/Dispute Review Board to address matters in dispute between the Parties promptly and knowledgeably. The Project Neutral/Dispute Review Board shall issue nonbinding findings within five (5) business Days of referral of the matter to the Project Neutral, unless good cause is shown.

12.3.2 If the matter remains unresolved following the issuance of the nonbinding finding by the mitigation procedure or if the Project Neutral/Dispute Review Board fails to issue nonbinding findings

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within five (5) Days of the referral, the Parties shall submit the matter to the binding dispute resolution procedure designated in section 12.5.

12.4 MEDIATION If direct discussions pursuant to section 12.2 do not result in resolution of the matter and no dispute mitigation procedure is selected under section 12.3, the Parties shall endeavor to resolve the matter by mediation through the current Construction Industry Mediation Rules of the American Arbitration Association, or the Parties may mutually agree to select another set of mediation rules. The administration of the mediation shall be as mutually agreed by the Parties. The mediation shall be convened within thirty (30) business Days of the matter first being discussed and shall conclude within forty-five (45) business Days of the matter first being discussed. Either Party may terminate the mediation at any time after the first session, but the decision to terminate shall be delivered in person by the terminating Party to the non-terminating Party and to the mediator. The costs of the mediation shall be shared equally by the Parties.

12.5 BINDING DISPUTE RESOLUTION If the matter is unresolved after submission of the matter to a mitigation procedure or to mediation, the Parties shall submit the matter to the binding dispute resolution procedure designated herein.

(Designate only one.)

☐ Arbitration using the current Construction Industry Arbitration Rules of the American Arbitration Association

☒ Litigation in either the state or federal court having jurisdiction of the matter in the location of the Project.

12.5.1 The costs of any binding dispute resolution procedures shall be borne by the non-prevailing Party, as determined by the adjudicator of the dispute. However, the costs of binding dispute resolution does not include attorney fees. The Parties are each responsible for paying for their own attorney fees.

12.5.2 VENUE The venue of any binding dispute resolution procedure shall be Des Moines, Iowa.

12.6 MULTIPARTY PROCEEDING All parties necessary to resolve a claim shall be parties to the same dispute resolution proceeding. Appropriate provisions shall be included in all other contracts relating to the Work to provide for the joinder or consolidation of such dispute resolution procedures.

12.7 LIEN RIGHTS The Trade Contractor acknowledges that it has no mechanic's lien rights on this Project because it is a public improvement project.

ARTICLE 13 MISCELLANEOUS PROVISIONS

13.1 ASSIGNMENT Neither the Owner nor the Trade Contractor shall assign their interest in this Agreement without the written consent of the other except as to the assignment of proceeds. The terms and conditions of this Agreement shall be binding upon both Parties, their partners, successors, assigns and legal representatives. Neither Party to this Agreement shall assign the Agreement as a whole without written consent of the other. If either Party attempts to make such an assignment, that Party shall nevertheless remain legally responsible for all obligations under this Agreement, unless otherwise agreed by the other Party.

13.2 GOVERNING LAW This Agreement and all disputes arising there from shall be governed by the Iowa law.

13.3 SEVERABILITY The partial or complete invalidity of any one or more provisions of this Agreement shall not affect the validity or continuing force and effect of any other provision.

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13.4 NO WAIVER OF PERFORMANCE The failure of either Party to insist, in any one or more instances, on the performance of any of the terms, covenants or conditions of this Agreement, or to exercise any of its rights, shall not be construed as a waiver or relinquishment of such term, covenant, condition or right with respect to further performance or any other term, covenant, condition or right.

13.5 TITLES AND GROUPINGS The titles given to the articles of this Agreement are for ease of reference only and shall not be relied upon or cited for any other purpose. The grouping of the articles in this Agreement and of the Owner's specifications under the various headings is solely for the purpose of convenient organization and in no event shall the grouping of provisions, the use of sections or the use of headings be construed to limit or alter the meaning of any provisions.

13.6 ASSISTANCE OF COUNSEL AND INTERPRETATION The Parties agree that they had the opportunity to obtain the assistance of counsel in reviewing the Agreement terms prior to execution. This Agreement shall be construed neither against nor in favor of either Party, but shall be construed in a neutral manner.

13.7 RIGHTS AND REMEDIES The Parties' rights, liabilities, responsibilities and remedies with respect to this Agreement, whether in contract, tort, negligence or otherwise, shall be exclusively those expressly set forth in this Agreement.

13.8 ADDITIONAL PROVISIONS (Insert here other provisions, if any, that pertain to this Agreement See Below.)

13.9 COMPLIANCE WITH LAW AND REGULATIONS The Trade Contractor shall comply with all applicable federal, state, and local laws, rules, ordinances, regulations and orders when performing services and/or performing work under this Agreement, including without limitation, all laws applicable to the prevention of discrimination in employment and the use of targeted small businesses as subcontractors or suppliers. The Trade Contractor declares that it has complied with all federal, state and local laws regarding business permits and licenses that may be required to provide the services and work required by this Agreement. The Trade Contractor further acknowledges that if this Project is a recipient of Federal financial assistance that it may be subject to requirements of Federal Acts and Executive Orders as mandated by Federal agencies having authority and jurisdiction to enforce and ensure compliance with such laws and regulations including, but not necessarily limited to, the Davis Bacon Act and other Federal Acts and Executive Orders.

13.10 EMPLOYMENT PRACTICES: It is the intent of the Iowa Department of Administrative Services to assure equal employment opportunity in all contract work as required by law. Vendors, are required to take affirmative action to ensure that applicants employed or seeking employment with them are treated equally as required by law. Vendors shall not illegally discriminate against any employee. During the course of the Project, the Vendor may be required to show compliance with the EEO and Affirmative Action requirements. Noncompliance with the provisions set forth at the time of contract award may result in termination or suspension of the Agreement in whole or in part. All vendors and service providers working under the terms of this Agreement are prohibited from engaging in discriminatory employment practices forbidden by Iowa law. Vendors shall complete and submit the Nondiscrimination Clause form for the Owner's approval.

13.11 RECIPROCAL BIDDER PREFERENCE In accordance with Iowa Code Section 73A.21, as amended in 2011 by HF 648, if the Trade Contractor is not a resident bidder of Iowa, as defined by law, then the Trade Contractor must specifically identify in writing with its bid any and all preferences or preferential treatment (including preferences related to labor) enforced by the state or foreign country in which the Trade Contractor is a resident. If the low bid Trade Contractor is not a resident bidder of Iowa and the Trade Contractor's foreign State of residence enforces such a preference then the Owner shall reciprocally enforce the preference in favor of a resident bidder of Iowa. Failure on the part of the Trade Contractor to completely and accurately abide by this legal requirement may, among other things, result in civil penalties and void this Agreement. The Trade Contractor should contact its attorney regarding this legal requirement if the Trade

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Contractor has questions regarding its meaning or application.

13.12 LABOR RELATIONS The Trade Contractor shall comply with all Iowa and Federal labor laws. In accordance with Executive Order Number 69, issued by the Governor of Iowa on or about January 14, 2011, no project labor agreement (also known as a PLA), or similar, will be used on this Project. Iowa is a right to work state. No consultant, contractor, or employee shall be obligated to contract with or join any labor organization as a condition of performing work on this Project.

ARTICLE 14 TRADE CONTRACT DOCUMENTS

14.1 The Trade Contract Documents in existence at the time of execution of this Agreement are as follows:

RFBXXXXXXXXX Bid Package X

14.2 INTERPRETATION OF TRADE CONTRACT DOCUMENTS

14.2.1 The drawings and specifications are complementary. If Trade Contract Work is shown only on one but not on the other, the Trade Contractor shall perform the Trade Contract Work as though fully described on both consistent with the Trade Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

14.2.2 In case of conflicts between the drawings and specifications, the specifications shall govern. In any case of omissions or errors in figures, drawings or specifications, the Trade Contractor shall immediately submit the matter to the Owner for clarification. The Owner's clarifications are final and binding on all Parties, subject to an equitable adjustment in Trade Contract Time or Price pursuant to ARTICLE 6 and ARTICLE 7 or dispute resolution in accordance with ARTICLE 12.

14.2.3 Where figures are given, they shall be preferred to scaled dimensions.

14.2.4 Any terms that have well-known technical or trade meanings, unless otherwise specifically defined in this Agreement, shall be interpreted in accordance with their well-known meanings. This Agreement entered into as of the date entered in ARTICLE 1.

14.2.5 PRECEDENCE In case of any inconsistency, conflict or ambiguity among the Trade Contract Documents, the documents shall govern in the following order: (a) Trade Contract Change Orders and written amendments to this Agreement; (b) this Agreement; (c) subject to subsection 14.2.2 the drawings, specifications and addenda issued prior to the execution of this Agreement; (d) approved submittals; (e) information furnished by the Owner pursuant to subsection 4.1.3; (f) other documents listed in this Agreement. Among all the Trade Contract Documents, the term or provision that is most specific or includes the latest date shall control. Information identified in one Trade Contract Document and not identified in another shall not be considered to be a conflict or inconsistency.

This Agreement entered into as of the date entered in ARTICLE 1.

OWNER State of Iowa, Department of Administrative Services

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Trade Contractor: *Contractor Name*

By: _____

(Authorized Representative)

Name:

Title:

Date:

Owner: State of Iowa - DAS

By: _____

(Authorized Representative)

Name:

Title:

Date:

END OF DOCUMENT.

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SECTION 00 6000

PERFORMANCE AND PAYMENT BOND

PART 1 - GENERAL

1.01 PERFORMANCE AND PAYMENT BOND

A. Performance and payment bonds to be used on this project, ConsensusDocs 260 and 261 are attached for reference following this page. ConsensusDocs performance and payment bonds are not required (other standard forms are acceptable to the State of Iowa).

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION



CONSENSUSDOCS 260

PERFORMANCE BOND

This document was developed through a collaborative effort of organizations representing a wide cross-section of the design and construction industry. The organizations endorsing this document believe it represents a fair allocation of risk and responsibilities for all project participants.

Endorsing organizations recognize that this document must be reviewed and adapted to meet specific needs and applicable laws. This document has important legal and insurance consequences. You are encouraged to consult legal, insurance and surety advisors before completing or modifying this document. The software includes a notes section indicating where information is to be inserted to complete this document. Further information and endorsing organizations' perspectives are available at www.consensusdocs.org/guidebook.

For Use with ConsensusDOCS 200, Standard Form of Agreement and General Conditions Between Owner and Constructor (Where the Contract Price is a Lump Sum) and ConsensusDOCS 500, Standard Agreement and General Conditions Between Owner and Construction Manager.

The Owner, _____,(the "Owner") and the Constructor, _____,(the "Constructor") have entered into a Contract (the "Contract") dated _____ for _____(the "Project"). The Contract is incorporated by reference into this Performance Bond (the "Bond").

By virtue of this Bond, the Constructor as Principal and _____as Surety ("Surety"), are bound to the Owner as Obligee in the maximum amount of _____Dollars ($_____)(the "Bond Sum"). The Constructor and Surety hereby bind themselves, their heirs, executors,

IMPORTANT: A vertical line in the margin indicates a change has been made to the original text. Prior to signing, recipients may wish to request from the party producing the document a "redlined" version indicating changes to the original text. Consultation with legal and insurance counsel and careful review of the entire document are strongly encouraged.
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administrators, successors and assigns, jointly and severally, as provided herein.

1. GENERAL CONDITIONS It is the condition of this Bond that if the Constructor performs its Contract obligations (the "Work"), the Surety's obligations under this Bond are null and void. Otherwise the Surety's obligations shall remain in full force and effect. The Surety waives any requirement to be notified of alterations or extensions of time made by the Owner in the Contract. The Owner may not invoke the provisions of this Bond unless the Owner has performed its obligations pursuant to the Contract. Upon making demand on this Bond, the Owner shall make the Contract Balance (the total amount payable by the Owner to the Constructor pursuant to the Contract less amounts properly paid by the Owner to the Constructor) available to the Surety for completion of the Work.

2. SURETY OBLIGATIONS If the Constructor is in default pursuant to the Contract and the Owner has declared the Constructor in default, the Surety promptly may remedy the default or shall

a. Complete the Work, with the consent of the Owner, through the Constructor or otherwise,

b. Arrange for the completion of the Work by a Constructor acceptable to the Owner and secured by performance and payment bonds equivalent to those for the Contract issued by a qualified surety. The Surety shall make available as the Work progresses sufficient funds to pay the cost of completion of the Work less the Contract Balance up to the Bond Sum, or

c. Waive its right to complete the Work and reimburse the Owner the amount of its reasonable costs, not to exceed the Bond Sum, to complete the Work less the Contract Balance.

3. DISPUTE RESOLUTION All disputes pursuant to this Bond shall be instituted in any court of competent jurisdiction in the location in which the Project is located and shall be commenced within two years after default of the Constructor or Substantial Completion of the Work, whichever occurs first. If this provision is prohibited by law, the minimum period of limitation available to sureties in the jurisdiction shall be applicable.

This Bond is entered into as of _____.

SURETY _____(seal)

By: .....

Print Name: _____

Print Title: _____

(Attach Power of Attorney)

Witness: .....

CONSTRUCTOR _____(seal)

By: .....

Print Name: _____

Print Title: _____

Witness: .....

(Additional signatures, if any, appear on attached page)

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CONSENSUSDOCS 261

PAYMENT BOND

This document was developed through a collaborative effort of organizations representing a wide cross-section of the design and construction industry. The organizations endorsing this document believe it represents a fair allocation of risk and responsibilities for all project participants.

Endorsing organizations recognize that this document must be reviewed and adapted to meet specific needs and applicable laws. This document has important legal and insurance consequences. You are encouraged to consult legal, insurance and surety advisors before completing or modifying this document. The software includes a notes section indicating where information is to be inserted to complete this document. Further information and endorsing organizations' perspectives are available at www.consensusdocs.org/guidebook.

For Use with ConsensusDOCS 200, Standard Form of Agreement and General Conditions Between Owner and Constructor (Where the Contract Price is a Lump Sum) and ConsensusDOCS 500, Standard Agreement and General Conditions Between Owner and Construction Manager.

The Owner, _____,(the "Owner ") and the Constructor, _____, (the "Constructor") have entered into a Contract (the "Contract") dated _____ for _____(the "Project"). The Contract is incorporated by reference into this Payment Bond (the "Bond").

By virtue of this Bond, the Constructor as Principal and _____as Surety ("Surety"), are bound to the Owner as Obligee in the maximum amount of _____Dollars ($_____)(the "Bond Sum"). The Constructor and Surety hereby bind themselves, their heirs, executors,

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administrators, successors and assigns, jointly and severally, as provided herein.

1. GENERAL CONDITIONS It is the condition of this Bond that if the Constructor promptly makes payment of all sums for all labor, materials, and equipment furnished for use in the performance of the work required by the Contract, the Surety's obligations pursuant to this Bond are null and void. Otherwise the Surety's obligations shall remain in full force and effect. The Surety waives any requirement to be notified of alterations or extensions of time made by the Owner in the Contract.

2. SURETY OBLIGATION Every Claimant who has not been paid in full before the expiration of a period of ninety (90) Days after such Claimant provided or performed the last of the work or labor, or furnished the last of the materials for which said claim is made, may have a right of action on this Bond. The Surety's obligation to the Claimant(s) shall not exceed the Bond Sum.

3. LIMITATION OF ACTION No suit or action shall be commenced on this Bond by any Claimant

a. Unless Claimant, other than one having a direct Contract with the Constructor, shall have given written notice to the Constructor, the Owner and the Surety within ninety (90) Days after the Claimant provided or performed the last of the work or labor, or furnished the last of the materials for which the claim is made, stating with substantial accuracy the amount claimed and the name of the Party to whom the materials were furnished, or for whom the work or labor was provided or performed. Such notice shall be served by any means which provides written third party verification of delivery to the Constructor at any place it maintains an office or conducts business, or served in any manner in which legal process may be served in the state in which the Project is located.

b. After the expiration of one (1) year from the date on which the Claimant last performed labor or furnished materials or equipment on the Project. If this provision is prohibited by law, the minimum period of limitation available to sureties in the jurisdiction shall be applicable.

c. Other than in any court of competent jurisdiction in the location in which the Project is located.

4. CLAIMANT A Claimant is defined as an individual or entity having a direct contract with the Constructor or having a contract with a subcontractor having a direct contract with the Constructor to furnish labor, materials or equipment for use in the performance of the Contract.

This Bond is entered into as of _____.

SURETY _____(seal)

By: .....

Print Name: _____

Print Title: _____

(Attach Power of Attorney)

Witness: .....

CONSTRUCTOR _____(seal)

By: .....

Print Name: _____

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Print Title: _____

Witness: .....

(Additional signatures, if any, appear on attached page)

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SECTION 01 1200

CONTRACT SUMMARY

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Project Information
B. Project Summary
C. Bid Scope Summary
D. Work Hour Restrictions
E. Access to Site
F. Coordination with Occupants
G. Rules for Construction Workers
H. Bid Package Instructions

1.02 PROJECT INFORMATION

A. Facility Name/Location: Woodward Resource Center, 1251 334th Street, Woodward, Iowa 50276
B. DAS Project #: 9279.40 & 9279.41
C. Owner: State of Iowa, Department of Administrative Services, Hoover State Office Building, Level 3, 1305 East Walnut Street, Des Moines, IA 50319
D. Owner's Representative: Jennifer Kleene, Iowa Department of Administrative Services, 109 SE 13th Street, Des Moines, IA 50319
E. Construction Manager: Darren Milliken, Story Construction, 2810 Wakefield Circle, Ames, Iowa 50010

1.03 PROJECT SUMMARY

A. The project includes replacing the steam and chilled water systems with new air handler units, replacing current fire alarm, elevator repairs and installing a new fire suppression system in Linden Court building A & B and C & D.
B. Target date to provide substantial completion is Friday, February 25, 2028.

1.04 BID SCOPE SUMMARY

A. Scope Applicable to All Bid Packages:
   1. The Contractor's Work includes all labor, supervision, materials, equipment, services, supplies, tools, facilities, transportation, hoisting, storage, receiving, licenses, inspections, certifications, overhead, profit, or other items required or reasonably inferable to properly and timely perform and complete all work and services to be performed by the Contractor pursuant to this Agreement. Unless specifically stated otherwise, incidental work required to accomplish the work of this Bid Package shall be included the bid. This would include, but not be limited to, temporary facilities, protection of the work, security of equipment, materials, and work in progress, etc. Contractor's Work shall be performed in accordance with the Drawings, Specification Divisions 00 and 01, and Specification sections applicable to each Contractor's scope.
   2. Contractor is responsible for all labor and equipment to unload, account for all material delivered, stock, and delivery for this scope of work. Storage and delivery of materials and equipment at the Site shall be permitted only to the extent approved in advance by the Construction Manager, and if anything so stored obstructs the progress of any portion of the work, it shall be promptly removed or relocated by the Contractor without reimbursement.

3. On site supervision by Prime Contractor at all times work by that contractor or their subcontractors/suppliers is taking place.
4. Provide all temporary facilities required for this scope of work including trailer, trailer power, telephone, secured storage, temporary power for work, temporary and task lighting for work, etc. as determined necessary by Contractor. Coordinate location of trailers, material storage and utility lines with Construction Manager. Limited space is available, and permission to bring any such facility or excess materials on to the site shall be approved by the Construction Manager.
5. Contractor shall provide all equipment and tools for Contractor's own cleanup. Clean up shall be done at end of every shift or more frequently if required for the Contractor to perform their work, for other Contractors to perform their work, as required by the Owner's operations, and at the discretion of the Construction Manager.
6. All turf, landscaping, and subgrade disturbances caused by equipment traffic or other activities related to the Contractor's scope shall be repaired or restored to proper conditions by the Contractor.
7. Protect adjacent existing building elements from damage from Scope of work. Repair existing building elements damaged during Contractor's Scope of work.
8. Contractors will need to plan on providing their own internet access if needed.
9. Each person working onsite (excluding delivery drivers) shall attend a 30-minute Woodward Resource Center and Story Construction Co. safety orientation prior to site entry. Upon successful completion of the orientation, each person will receive a hard-hat sticker to identify successful completion. Each person must successfully complete the orientation prior to being allowed onsite to perform work. A 24-hour notice to the Construction Manager of the need for an orientation is required.
10. Each Contractor shall designate a representative to attend one 60-minute pre-construction meeting.
11. Each Contractor and their Subcontractors shall designate an onsite representative to attend a daily 15-minute "End of Shift Meeting" on days which work is performed by them.
12. Each Contractor and their Subcontractors shall designate an onsite representative to attend a weekly 30-minute production and planning meeting the weeks which work is performed by them, plus the two (2) weeks ahead of each Contractor/Subcontractor starting work on site.
13. Prior to the weekly production and planning meeting, each Contractor and their Subcontractors shall populate the project planning and communication board with daily activities. This shall include activity description, quantity of work planned for completion daily, crew size for each activity, and location of each activity. The Construction Manager will assist with the population of the board.
14. Each Contractor shall have their Project Manager and onsite representative attend a Story Construction Co. Planning and Production system orientation. Plan for this meeting to last 2-hours

1.05 WORK HOUR RESTRICTIONS

A. Work hours are from 07:00 AM to 05:00 PM, Monday through Friday unless arrangements are made in advance.

1.06 CONTRACTOR USE OF SITE AND PREMISES

A. Construction Operations: Limited to areas noted on Drawings.

B. Provide access to and from site as required by law and 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 permission of Owner and permit if required.

C. Facility will be occupied at all times during duration of work. Contractor personnel shall conduct themselves in an agreeable manner at all times. Failure to do so may result in removal from the work site.

1.07 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.

1.08 RULES FOR CONSTRUCTION WORKERS

A. The staff of the State of Iowa has a responsibility to protect the public by providing a secure environment. All work site rules must be followed to the letter, at all times.
B. All construction workers must have a background check completed prior to entering the campus to perform work.
C. Hot Work Permit Processes and Fire Watch, when necessary, will be adhered to for this project.
D. All State properties are tobacco free. No smoking will be permitted or tolerated on campus unless in designated areas.
E. You are permitted access only to the work site and no other area of the institution.
F. No drugs, alcohol, or firearms are allowed on the work site.
G. Do not leave money, drugs, alcohol, or firearms in your personal vehicle.
H. Company and personal vehicles are to be parked and locked in designated or authorized area of the work.
I. Secure all tools at the end of the day.
J. Maintain control of all tools, supplies, and debris at all times during the work.
K. Never leave keys in any vehicle. If a security officer finds keys in a vehicle, they are under orders to turn them into a security supervisor.
L. Do not give anything to residents or take anything from residents; if they offer, inform your supervisor.
M. Secure all tools at the end of each day. Never leave tools unattended. All tools shall be checked in at the beginning of the day and checked out at the end of the day. If security officers find loose tools, they are under orders to turn them in to their supervisor.
N. All delivery vehicles must go directly to the job site. Extra time should be anticipated for all deliveries. Provide 24-hour notice to the facility of deliveries.
O. During an emergency, follow the instructions of the security staff.
P. Ladders and scaffolding must be taken down when not in use and at the end of each shift.
Q. Fuel cans are always to be secured.
R. Photography of the Woodward Resource Center residents or employees is prohibited.
S. Woodward Academy will require a PREA training prior to starting construction. All Contractors must complete initial and annual training for sexual assault/rape prevention, incident response and reporting. At the conclusion of each training session, all trainees must sign that they attended and understood the training.

1.09 BID PACKAGE INSTRUCTIONS

A. **Bid Package #01-1** – Abatement: Trade Contractor shall include all of the following, but not limited to, as part of the contract:

1. Specifications:
    a. Division 00 – Procurement and Contracting Requirements
    b. Division 01 – General Requirements
        1) Section 01 9000 Atlas Abatement Specifications dated 04/16/2026
            a) Complete
    c. Division 02 – Existing Conditions
        1) Complete
2. Drawings: See responsibility matrix with exceptions explained below.
    a. 09-MD100, 09-MD101, 09-MD102, 13-MD100, 13-MD101, 13-MD102
        1) Abate insulation on mechanical room piping.
    b. 09-MD201, 09-MD202, 13-MD201, 13-MD202
        1) Remove ACT ceilings, ductwork, and connecting registers. Exclude removal of mechanical units A-1-1, A-2-1, B-1-1, B-2-1, C-1-1, C-2-1, D-1-1, and D-2-1. Plaster ceiling supporting ductwork is hazardous, so abatement is needed for the plaster ceiling.
    c. 09-ED201, 09-ED202, 13-ED201, 13-ED202
        1) Support conduit and low voltage wiring as described in note 09-E029 and remove light fixtures as described in note 09-ED032
    d. 13-AD02
        1) Abate window per note AD03.

3. **Unit Price #01** – Floor Tile and Mastic: Trade Contractor shall include all of the following, but not limited to, as part of the contract:
    a. One unit to include: Cost for labor and material for abatement of one (1) square foot of floor tile and mastic.
    b. Unit prices include all necessary material, plus cost for delivery, installation, insurance, overhead, and profit.
    c. Owner reserves the right to reject Contractor's measurements of work in place that involves use of established unit prices and to have this work measured, at the Owner's expense, by an independent surveyor acceptable to the Contractor.

4. **Unit Price #02** – Window Glazing: Trade Contractor shall include all of the following, but not limited to, as part of the contract:
    a. One unit to include: Cost for labor and material to abate one (1) window and frame.
    b. Unit prices include all necessary material, plus cost for delivery, installation, insurance, overhead, and profit.
    c. Owner reserves the right to reject Contractor's measurements of work in place that involves use of established unit prices and to have this work measured, at the Owner's expense, by an independent surveyor acceptable to the Contractor.

5. **Unit Price #03** – Additional Electrical Box Installation: Trade Contractor shall include all of the following, but not limited to, as part of the contract:
    a. One unit to include: Cost for labor and material with drilling and screw installation of one (1) electrical box and conduit strap. Assume 3-4 drill holes per box and 1-2 for the conduit strap.
    b. Unit prices include all necessary material, plus cost for delivery, installation, insurance, overhead, and profit.
    c. Owner reserves the right to reject Contractor's measurements of work in place that involves use of established unit prices and to have this work measured, at the Owner's expense, by an independent surveyor acceptable to the Contractor.

B. **Bid Package #09-1** – General Construction: Trade Contractor shall include all of the following, but not limited to, as part of the contract:

1. Specifications:
    a. Division 00 – Procurement and Contracting Requirements
    b. Division 01 – General Requirements
        1) Exclude Section 01 9000 Atlas Abatement Specifications dated 04/16/2026
    c. Division 02 – Existing Conditions
        1) Specification 02 4100 Demolition. Complete all demo work associated with work corresponding to BP #09-1
    d. Division 03 – Concrete
        1) Complete
    e. Division 04 – Masonry
        1) Complete
    f. Division 06 – Wood, Plastics, and Composites
        1) Complete
    g. Division 07 – Thermal and Moisture Protection
        1) Specification 07 8100 Applied Fire Protection – for adjacent work completed by BP #09-1
        2) Specification 07 8400 Firestopping - for adjacent work completed by BP #09-1
        3) Specification 07 9000 Joint Sealants – for adjacent work completed by BP #09-1
    h. Division 08 – Openings
        1) Complete
    i. Division 09 – Finishes
        1) Complete

2. Drawings: See responsibility matrix for pricing breakdown and exceptions explained below.
    a. 9279.40 Decentralization General Construction
        1) 00-C101 and 00-C102
            a) Exclude steel supports and foundations required for ductwork supports.
        2) 00-C501
            a) Exclude detail C2 for ductwork supports.
        3) 09-G100 and 13-G100
            a) Follow all code guidelines and notes A10 and A14.
        4) 09-A100 and 13-A100
            a) Exclude notes A11, A15, A18, A24, and A25.
        5) 13-A102
            a) Include only note A22.
    b. 9279.41 Fire Suppression General Construction
        1) 09-G100 and 13-G100
            a) Follow all code guidelines and notes A01 and A02. Penetrations through CMU will be performed by BP #23-1.
        2) 09-AD01, 09-AD02, 13-AD01, 13-AD02
            a) Include only demolition of door frames, doors, and drywall.
        3) 09-A100 and 13-A100
            a) Include only note A11.
        4) 09-A101, 09-A102, 13-A101, 13-A102
            a) Include only note A11 and interior walls.
        5) 13-AD00
            a) Exclude demo of louver near Mechanical B10.

3. Clarification: Contractor shall be lead-certified, and all work done on areas with lead-containing or lead-based paint must be done by a lead-certified crew member.

4. Clarification: Contractor will be responsible for patching all holes created by construction from this Bid Package. All patches are to help the building maintain a 1-hour fire rating. It is recommended to have a site visit to help quantify this work.

5. Clarification: Exclude all pipe and ductwork penetrations shown on A sheets.

6. Clarification: Housekeeping pads to be by Bid Packages #21-1, #23-1, #26-1 as associated to their work.

C. **Bid Package #21-1** – Fire Suppression: Trade Contractor shall include all of the following, but not limited to, as part of the contract:
   1. Specifications:
      a. Division 00 – Procurement and Contracting Requirements
      b. Division 01 – General Requirements
         1) Exclude Section 01 9000 Atlas Abatement Specifications dated 04/16/2026
      c. Division 02 – Existing Conditions
         1) Specification 02 4100 Demolition. Complete all demo work associated with work corresponding to BP #21-1
      d. Division 07 – Thermal and Moisture Protection
         1) Specification 07 8100 Applied Fire Protection – for adjacent work completed by BP #21-1
         2) Specification 07 8400 Firestopping - for adjacent work completed by BP #21-1
         3) Specification 07 9000 Joint Sealants – for adjacent work completed by BP #21-1
      e. Division 21 – Fire Suppression
         a) Complete

   2. Drawings: See responsibility matrix for required drawings.

   3. Clarification: Contractor shall be lead-certified, and all work done on areas with lead-containing or lead-based paint must be done by a lead-certified crew member.

   4. Clarification: Contractor will be responsible for patching all holes created by construction from this Bid Package. All patches are to help the building maintain a 1-hour fire rating. It is recommended to have a site visit to help quantify this work.

   5. Clarification: Housekeeping pads to be by Bid Packages #21-1, #23-1, #26-1 as associated to their work.

D. **Bid Package #23-1** – Decentralization Mechanical: Trade Contractor shall include all of the following, but not limited to, as part of the contract:
   1. Specifications:
      a. Division 00 – Procurement and Contracting Requirements
      b. Division 01 – General Requirements
         1) Exclude Section 01 9000 Atlas Abatement Specifications dated 04/16/2026
      c. Division 02 – Existing Conditions
         1) Specification 02 4100 Demolition. Complete all demo work associated with work corresponding to BP #23-1.
      d. Division 07 – Thermal and Moisture Protection

1) Specification 07 8100 Applied Fire Protection – for adjacent work completed by BP #23-1
2) Specification 07 8400 Firestopping – for adjacent work completed by BP #23-1
3) Specification 07 9000 Joint Sealants – for adjacent work completed by BP #23-1.

e. Division 23 – HVAC
1) Complete.

2. Drawings: See responsibility matrix with exceptions explained below.
a. 00-C101 and 00-C102
1) Include steel supports and foundations required for ductwork supports.
b. 00-C501
1) Include detail C2 for ductwork supports.
c. 09-AD01, 09-AD02, 13-AD01, 13-AD02
1) Include only note AD02.
d. 09-A100, 13-A100
1) Include notes A18, A24, and A25
e. 09-A101, 09-A102, 13-A101, 13-A102
1) Include note A21.
f. 09-MD100, 09-MD101, 09-MD102, 13-MD100, 13-MD101, 13-MD102
1) Demo of pipes and devices can occur after abatement of piping has been completed in the mechanical rooms.
g. 09-MD201, 09-MD202, 13-MD201, 13-MD202
1) Removal of mechanical units A-1-1, A-2-1, B-1-1, B-2-1, C-1-1, C-2-1, D-1-1, and D-2-1. Plaster ceiling supporting ductwork is hazardous, so abatement will remove ductwork with plaster abatement.
h. 13-AD00
1) Include demo of louver near Mechanical B10.

3. Clarification: Contractor shall be lead-certified, and all work done on areas with lead-containing or lead-based paint must be done by a lead-certified crew member.

4. Clarification: Contractor will need to coordinate and follow requests by Systems Works who is the Commissioning Agent for this project.

5. Clarification: Contractor will be responsible for patching all holes created by construction from this Bid Package. All patches are to help the building maintain a 1-hour fire rating. It is recommended to have a site visit to help quantify this work.

6. Clarification: Housekeeping pads to be by Bid Packages #21-1, #23-1, #26-1 as associated to their work.

E. **Bid Package #26-1** – Decentralization Electrical & Fire Alarm & Elevator Repair: Trade Contractor shall include all of the following, but not limited to, as part of the contract:
1. Specifications:
a. Division 00 – Procurement and Contracting Requirements
b. Division 01 – General Requirements
1) Exclude Section 01 9000 Atlas Abatement Specifications dated 04/16/2026
c. Division 02 – Existing Conditions
1) Specification 02 41 00 Demolition. Complete all demo work associated with work corresponding to BP #26-1.
d. Division 07 – Thermal and Moisture Protection
1) Specification 07 8100 Applied Fire Protection – for adjacent work completed by BP #26-1

2) Specification 07 8400 Firestopping – for adjacent work completed by BP #26-1
3) Specification 07 9000 Joint Sealants – for adjacent work completed by BP #26-1.

e. Division 14 – Conveying Equipment
1) Complete
f. Division 26 – Electrical
1) Complete.
g. Division 27 – Communications
1) Complete.
h. Division 28 – Electronic Safety and Security
1) Complete.

2. Drawings: See responsibility matrix for pricing breakdown and exceptions explained below.
a. 9279.40 Electrical & Fire Alarm
1) 09-G100, 13-G100
a) Follow all code guidelines as applicable.
2) 09-ED201, 09-ED202, 13-ED201, 13-ED202
a) All work except temporary conduit and low voltage support and light fixture removal.
3) 09-E200 and 13-E200
a) All work except notes 09-E027, 09-E028, 13-E027 and 13-E028.
b. 9279.41 Elevator Modifications
1) 09-G100, 13-G100
a) Follow all code guidelines as applicable.
2) 09-A100, 09-A101, 09-A102, 13-A100, 13-A101, 13-A102,
a) Only notes A15 and A16
3) 09-E200 and 13-E200
a) Only notes 09-E027, 09-E028, 13-E027 and 13-E028.

3. Clarification: Contractor shall be lead-certified, and all work done on areas with lead-containing or lead-based paint must be done by a lead-certified crew member.

4. Fire alarm demo work must be completed at the end of the project after all new fire alarm systems are operational.

5. Clarification: Contractor will be responsible for patching all holes created by construction from this Bid Package. All patches are to help the building maintain a 1-hour fire rating. It is recommended to have a site visit to help quantify this work.

6. Clarification: Housekeeping pads to be by Bid Packages #21-1, #23-1, #26-1 as associated to their work.

7. **Unit Price #01** – Smoke Detector: Trade Contractor shall include all of the following, but not limited to, as part of the contract:
a. One unit to include: Cost for labor and material for device, 30’ of conduit and 30’ of fire alarm cable. Programming of device to also be included.
b. Unit prices include all necessary material, plus cost for delivery, installation, insurance, overhead, and profit.
c. Owner reserves the right to reject Contractor’s measurements of work in place that involves use of established unit prices and to have this work measured, at the Owner’s expense, by an independent surveyor acceptable to the Contractor.

8. **Unit Price #02** – Heat Detector: Trade Contractor shall include all of the following, but not limited to, as part of the contract:
    a. One unit to include: Cost for labor and material for device, 30’ of conduit and 30’ of fire alarm cable. Programming of device to also be included.
    b. Unit prices include all necessary material, plus cost for delivery, installation, insurance, overhead, and profit.
    c. Owner reserves the right to reject Contractor’s measurements of work in place that involves use of established unit prices and to have this work measured, at the Owner’s expense, by an independent surveyor acceptable to the Contractor.

9. **Unit Price #03** – Duct Smoke Detector: Trade Contractor shall include all of the following, but not limited to, as part of the contract:
    a. One unit to include: Cost for labor and material for device, 30’ of conduit and 30’ of fire alarm cable. Programming of device to also be included.
    b. Unit prices include all necessary material, plus cost for delivery, installation, insurance, overhead, and profit.
    c. Owner reserves the right to reject Contractor’s measurements of work in place that involves use of established unit prices and to have this work measured, at the Owner’s expense, by an independent surveyor acceptable to the Contractor.

10. **Unit Price #04** – Fire Alarm Relay: Trade Contractor shall include all of the following, but not limited to, as part of the contract:
    a. One unit to include: Cost for labor and material for device, 30’ of conduit and 30’ of fire alarm cable. Programming of device to also be included.
    b. Unit prices include all necessary material, plus cost for delivery, installation, insurance, overhead, and profit.
    c. Owner reserves the right to reject Contractor’s measurements of work in place that involves use of established unit prices and to have this work measured, at the Owner’s expense, by an independent surveyor acceptable to the Contractor.

11. **Unit Price #05** – Ceiling Mounted Speaker Strobe: Trade Contractor shall include all of the following, but not limited to, as part of the contract:
    a. One unit to include: Cost for labor and material for device, 30’ of conduit and 30’ of fire alarm cable. Programming of device to also be included.
    b. Unit prices include all necessary material, plus cost for delivery, installation, insurance, overhead, and profit.
    c. Owner reserves the right to reject Contractor’s measurements of work in place that involves use of established unit prices and to have this work measured, at the Owner’s expense, by an independent surveyor acceptable to the Contractor.

12. **Unit Price #06** – Wall Mounted Speaker Strobe: Trade Contractor shall include all of the following, but not limited to, as part of the contract:
    a. One unit to include: Cost for labor and material for device, 30’ of conduit and 30’ of fire alarm cable. Programming of device to also be included.
    b. Unit prices include all necessary material, plus cost for delivery, installation, insurance, overhead, and profit.
    c. Owner reserves the right to reject Contractor’s measurements of work in place that involves use of established unit prices and to have this work measured, at the Owner’s expense, by an independent surveyor acceptable to the Contractor.

13. **Unit Price #07** – Ceiling Mounted Strobe: Trade Contractor shall include all of the following, but not limited to, as part of the contract:
    a. One unit to include: Cost for labor and material for device, 30’ of conduit and 30’ of fire alarm cable. Programming of device to also be included.
    b. Unit prices include all necessary material, plus cost for delivery, installation, insurance, overhead, and profit.
    c. Owner reserves the right to reject Contractor’s measurements of work in place that involves use of established unit prices and to have this work measured, at the Owner’s expense, by an independent surveyor acceptable to the Contractor.

14. **Unit Price #08** – Wall Mounted Strobe: Trade Contractor shall include all of the following, but not limited to, as part of the contract:
    a. One unit to include: Cost for labor and material for device, 30’ of conduit and 30’ of fire alarm cable. Programming of device to also be included.
    b. Unit prices include all necessary material, plus cost for delivery, installation, insurance, overhead, and profit.
    c. Owner reserves the right to reject Contractor’s measurements of work in place that involves use of established unit prices and to have this work measured, at the Owner’s expense, by an independent surveyor acceptable to the Contractor.

F. **Work Performed by Owner:** WRC Staff or Construction Manager will perform the following work items:
    1. Relocate all moveable furniture, fixtures and equipment (FF&E), including window treatments; and personal materials from each sequenced work area prior to demolition and construction activities and after new construction is completed.
    2. Perform fire watch when necessary.
    3. Temporary granular surface for parking and laydown area.
    4. Temporary fencing for laydown area.
    5. Temporary window in-fills.
    6. Temporary lockable partition separating construction zones.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION

Responsibility Matrix

X - Contractor has full sheet

E - Contractor has portions of sheet (see contract summary for clarification)

Bid Package Drawing Sheet	#01-1 Abatement	#09-1 Decentralization General Construction	#09-1 Fire Suppression General Construction	#21-1 Fire Suppression	#23-1 Decentralization Mechanical	#26-1 Electrical & Fire Alarm	#26-1 Elevator Modifications
00-G000	X	X	X	X	X	X	X
00-G001	X	X	X	X	X	X	X
00-G101	X	X	X	X	X	X	X
00-C001		X					
00-CD01		X					
00-CD02		X					
00-C101		E			E		
00-C102		E			E		
00-C201		X					
00-C202		X					
00-C501		E			E		
00-A000	X	X	X		X	X	X
00-A001		X					
00-A002		X					
00-FP000				X			
00-M000					X		
00-E000						X	X
00-E012						X	
09-G100		E	E			E	E
09-AD00			X				
09-AD01			E		E		
09-AD02			E		E		
09-AD10		X					
09-AD11	X						
09-AD12	X						
09-A100		E	E		E		E
09-A101			E		E		E
09-A102			E		E		E
09-A110		X					
09-A111		X					
09-A112		X					
09-FP100				X			
09-FP101				X			
09-FP102				X			
09-MD100	E				E		
09-MD101	E				E		
09-MD102	E				E		
09-MD200					X		
09-MD201	E				E		
09-MD202	E				E		
09-M200					X		
09-M201					X		
09-M202					X		
09-M300					X		
09-M400					X		
09-M401					X		
09-M402					X		
09-M500					X		
09-M501					X		
09-M502					X		
09-M600					X		
09-ED200						X	
09-ED201	E					E	
09-ED202	E					E	
09-E100						X	
09-E101						X	
09-E102						X	
09-E200						E	E
09-E201						X	
09-E202						X	
09-E600						X	

Bid Package Drawing Sheet	#01-1 Abatement	#09-1 Decentralization General Construction	#09-1 Fire Suppression General Construction	#21-1 Fire Suppression	#23-1 Decentralization Mechanical	#26-1 Electrical & Fire Alarm	#26-1 Elevator Modifications
12-FP100				X			
13-G100		E	E			E	E
13-AD00			E		E		
13-AD01			E		E		
13-AD02	E		E		E		
13-AD10		X					
13-AD11	X						
13-AD12	X						
13-A100		E	E		E		E
13-A101			E		E		E
13-A102		E	E		E		E
13-A110		X					
13-A111		X					
13-A112		X					
13-FP100				X			
13-FP101				X			
13-FP102				X			
13-FP300				X			
13-MD100	E				E		
13-MD101	E				E		
13-MD102	E				E		
13-MD200					X		
13-MD201	E				E		
13-MD202	E				E		
13-M200					X		
13-M201					X		
13-M202					X		
13-M300					X		
13-M400					X		
13-M401					X		
13-M402					X		
13-M500					X		
13-M501					X		
13-M502					X		
13-M600					X		
13-ED200						X	
13-ED201	E					E	
13-ED202	E					E	
13-E100						X	
13-E101						X	
13-E102						X	
13-E200						E	E
13-E201						X	
13-E202						X	
13-E600						X	

SECTION 01 2500

SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Substitution Procedures
B. Request for Substitution form

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.01 SUBSTITUTION PROCEDURES

A. Where the Bidding Documents stipulate a specific product be provided by naming one or more manufacturer and model, a substitute product will be considered when written request is received by the date and time identified in Section 00 1113 NOTICE TO BIDDERS. Substitution requests will be considered for all products, even if the specification does not include a statement such as “or equal,” “equal to,” “equivalent to,” or “basis of design,” unless noted otherwise.
B. References in the Bidding Documents to brand or trade names are intended to illustrate the general characteristics of the item and not to limit competition unless noted otherwise.
C. The written request shall be on the “Request for Substitution” form included in the Project Manual. If no such form is included, the request shall be provided on the letterhead of the company making the request.
D. Substitution requests received after the specified date will be viewed in the context of a Change Order to the Contract, and consideration will only be given in the event a product becomes unavailable or not practical due to no fault of the Contractor, or the substitution is substantially to the Owner’s advantage (equal product for less cost or higher quality product at no change in Contract Sum).
E. Document each substitution request with complete data substantiating compliance of the proposed substitution with the Bidding Documents. Each request shall identify the specified product for which the substitution is requested, and shall clearly describe the product for which approval is requested. The burden shall be on the requester to demonstrate the proposed substitute product’s suitability for use in the Work and its equivalency or superiority in function, appearance, quality, and performance with the product named in the Bidding Documents.
F. A description of any changes to the Bidding Documents that the proposed substitution will require shall be included with the request. The requester shall affirm that dimensions shown on the Drawings will not be affected by the substitute product, and that it will have no adverse effect on other trades, the construction schedule, or specified warranty requirements. The request for use of a substitute product shall be signed by an authorized representative of the firm submitting the request, who shall state that the firm will pay for any changes to the building design, including Design Professional’s design, detailing, and construction cost caused by the requested substitution if the substitution is approved for use in the Work.
G. All such substitute products approved for use in the Work during the established period of time before receipt of Bids will be identified in a subsequent Addendum to the Bidding Documents.

3.02 REQUEST FOR SUBSTITUTION FORM

A. A Request for Substitution Form is attached following this page.
B. Substitution requests shall be emailed to the Issuing Officer at the email address provided in Instructions to Bidders Section 1.04.

END OF SECTION

SUBSTITUTION REQUEST FORM

Project: _____ Substitution Request Number: _____

_____ From: _____

To: _____ Date: _____

_____ A/E Project Number: _____

Re: _____

Specification Title: _____ Description: _____

Section: _____ Page: _____ Article/Paragraph: _____

Proposed Substitution: _____

Manufacturer: _____ Address: _____ Phone: _____

Trade Name: _____ Model No.: _____

_____ _____ _____

History: ☐ New product ☐ 2-5 years old ☐ 5-10 yrs old ☐ More than 10 years old

Differences between proposed substitution and specified product: _____

_____

_____

☐ Point-by-point comparative data prepared by contractor and attached - REQUIRED BY A/E

Reason for not providing specified item: _____

_____

Similar Installation:

Project: _____ Architect: _____

Address: _____ Owner: _____

_____ Date Installed: _____

Proposed substitution affects other parts of Work: ☐ No ☐ Yes; explain _____

_____

Supporting Data Attached: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐ _____

SUBSTITUTION REQUEST FORM

(Continued)

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs caused by the substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

_____

Telephone: _____

Attachments: _____

_____

_____

_____

A/E's REVIEW AND ACTION

☐ Substitution approved - Make submittals in accordance with Specification Section 01 3300.
☐ Substitution approved as noted - Make submittals in accordance with Specification Section 01 3300.
☐ Substitution rejected - Use specified materials.
☐ Substitution Request received too late - Use specified materials.

Signed by: Date:

Additional Comments: ☐ Contractor ☐ Subcontractor ☐ Supplier ☐ Manufacturer ☐ A/E ☐ _____

_____

_____

_____

_____

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SECTION 01 2600

CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Change procedures

1.02 CHANGE PROCEDURES

A. The Design Professional will advise of minor changes in the work not involving an adjustment to Contract Sum/Price or contract time as authorized.

B. The Construction Manager may issue a Proposal Request that includes a detailed description of a proposed change with supplementary or revised drawings and specifications and a change in contract time for executing the change as provided by the Design Professional. The Trade Contractor will prepare and submit an estimate within 7 calendar days. Estimates shall be provided for the project at no cost, regardless of acceptance or rejection of proposal.

C. The Trade Contractor may propose changes by submitting a Request for Information to the Construction Manager, describing the proposed change and its full effect on the work. Include a statement describing the reason for the change, and the effect on the Contract Sum/Price and contract time with full documentation and a statement describing the effect on work by separate or other contractors. Document any requested substitutions in accordance with the specifications. Construction Manager will forward the Request for Information on to the Design Professional for their official response.

D. Stipulated Sum/Price Change Order: Based on executed Change Order and contractor's fixed price quotation.

E. Unit Price Change Order: The change order will be executed on a fixed unit price basis for pre-determined unit prices and quantities. Changes in contract price or contract time will be computed as specified for time and material change orders.

F. Time and Material Change Order: The change order will be executed on a not to exceed basis. Design professional and Construction Manager will determine the not to exceed estimated cost based on contractor’s proposal for hourly rates and material costs. Maintain detailed records of work done on time and material basis. Time and Material tickets must be submitted daily to the Construction Manager for verification. Provide full information required for evaluation of proposed changes, and to substantiate costs for changes in the work. Submit itemized account and supporting data after completion of change. A final deductive change order will be issued to reconcile final cost to the initial change order.

G. Change Order Forms: CONSENSUSDOC Forms provided by Owner.

H. Execution of Change Orders: The Construction Manager will issue change orders for signature of parties as provided in the Conditions of the Contract.

I. With respect to pricing change orders, the percentage mark-up for overhead and profit is subject to the following limits:
   1. Fifteen (15) percent maximum for work directly performed by employees of the Constructor, Subcontractor or Sub-subcontractor.
   2. Five (5) percent maximum for work performed or passed through by a Subcontractor and passed through to the Owner by the Constructor.
   3. Five (5) percent maximum Subcontractor’s mark-up for Work performed by a Sub-Subcontractor and passed through to the Owner by the Subcontractor and Constructor.
   4. The maximum allowable mark-up shall be twenty-five (25) percent passed through to the Owner by the Constructor under any circumstances. Overhead and profit shall be shown separately for the Constructor and each Subcontractor of any tier performing the Change Order Work.

J. Contractor and subcontractor agree to provide and require all suppliers to provide, a detailed breakdown of labor, labor burden, materials, installation, rental, and fuel costs.

K. **Please refer to Article 8 of CONSENSUSDOCS 802- STANDARD FORM OR AGREEMENT BETWEEN OWNER AND TRADE CONTRACTOR for additional Change Procedures.**

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION

SECTION 01 2900

PAYMENT PROCEDURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Schedule of values
B. Application for payment

1.02 SCHEDULE OF VALUES

A. Coordination: Trade Contactor will coordinate preparation of the Schedule of Values with preparation of the Construction Manager's Construction Schedule.
   1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including Application for Payment forms with Continuation Sheets, Submittals Schedule, and Construction Manager's Construction Schedule.
   2. Submit original Schedule of Values in Procore within 14 days after date of Owner-Trade Contractor Agreement. Schedule of Values must be approved by Owner prior to submission for first application for payment.

B. Format: Utilize the Table of Contents of this project manual. Identify each line item with number and title of the major specification section. Each major specification section should be further itemized by materials cost, labor cost and subcontractor cost for each building separately for the base bid and all accepted alternates. Identify site mobilization, bonds and insurance and include a line item for closeout paperwork for a value of no less than 1% of the total contract value or $1,000, whichever is greater.
   1. Identification: Include the following Project identification on the Schedule of Values:
      a. Project name and location.
      b. Name and address of Owner, Trade Contractor, Construction Manager and Design Team.
      c. DAS Project Number.
      d. Date of Submittal.
   2. Revise the Schedule of Values to list approved Change Orders with each Application for Payment.

1.03 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications for payments as certified by the Design Professional and paid for by Owner.
   1. Application for Payment at time of Substantial Completion and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement. Progress payments shall be submitted to the Construction Manager. Any request for payment for work completed prior to June 30th of any year needs to be submitted by July 15th of the same calendar year.

C. Payment Application Forms: Use AIA form G702 and G703 as the form for the Application for Payment or an equivalent approved by the owner.

D. Include lien waiver forms required by the owner when applicable.

E. Application Preparation: Complete every entry on form. Construction Manager will return incomplete applications without action.
   1. Include amounts of Change Orders issued before last day of construction period covered by application.

F. Waivers of Mechanic's Lien: If requested by Owner with each Application for Payment, submit waivers of mechanic's lien from every entity who is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment when applicable.
   1. Owner reserves the right to designate which entities involved in the Work must submit waivers.
   2. Submit waivers of lien on forms, executed in a manner acceptable to Owner.

G. Initial Application for Payment: Administrative actions and submittals that must precede submittal of first Application for Payment include the following:
   1. Schedule of Values
   2. Certificates of insurance and insurance policies.
   3. Lists of vendors and any subcontractors.

H. Application for Payment at Substantial Completion: After the Certificate of Substantial Completion has been fully executed, submit an Application for Payment showing 100 percent completion for the portion of the Work claimed as substantially complete, not including the closeout paperwork line item.
   1. Include documentation supporting the claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
   2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

I. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
   1. Evidence of completion of Project closeout requirements.
   2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
   3. Updated final statement, accounting for final changes to the Contract Sum.
   4. AIA Document G706, “Contractor's Affidavit of Payment of Debts and Claims.”
   5. AIA Document G706A, “Contractor's Affidavit of Release of Liens.”
   6. AIA Document G707, “Consent of Surety to Final Payment.”
   7. Letter of Notification to all sub-contractors and suppliers of application for release of retainage.
   8. Evidence that claims have been settled.

J. Payments will be made to the extent of the value of the work performed in the previous month less a retainage amount of 3% of the value of the work performed. Upon substantial completion for the entire work, a sum sufficient to decrease the total retained to 3% of the contract sum, plus the full amount of the line item for closeout paperwork, plus such other retainage as the engineer shall determine for all incomplete work and unsettled claims will be authorized. The closeout paperwork line item may only be billed once the certificate of final completion has been fully executed.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION – NOT USED

END OF SECTION

SECTION 01 3100

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Coordination
B. Pre-construction meeting
C. Progress meetings
D. Coordination Meetings
E. Requests for Interpretation (RFIs)
F. Background Checks
G. Utility Locates/Ground Penetrations

1.02 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.
   1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
   2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
   3. Make adequate provisions to accommodate items scheduled for later installation.

B. Administrative procedures: The Trade Contractor will coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
   1. Preparation of Trade Contractor's Construction Schedule.
   2. Provide updated information for Construction Manager's Construction Schedule.
   3. Preparation of Schedule of Values.
   4. Delivery and processing of submittals.
   5. Progress meetings.
   6. Pre-installation conferences.
   7. Project closeout activities

C. Verify utility requirements and characteristics of 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, which are indicated diagrammatically on drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

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

F. Coordinate completion and cleanup of work of separate sections in preparation for Substantial Completion.

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.

H. During construction coordinate use of site and facilities through Construction Manager.

I. Comply with Construction Manager and Owner’s procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.

J. Make the following types of submittals to Architect through the Construction Manager via Procore:
   1. Request for Information/Interpretation.
   2. Request for substitution.
   3. Shop drawings, product data, and samples.
   4. Test and inspection reports.
   5. Design data.
   6. Manufacturer's instructions and field reports.
   7. Applications for payment and change order requests.
   8. Progress schedules.
   9. Coordination drawings.
   10. Correction punch list and final correction punch list for substantial completion
   11. Closeout submittals

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.01 PRE-CONSTRUCTION MEETING

A. The Construction Manager and Owner will schedule a meeting after Notice of Award.
B. Required: Design Professional, Owner, Construction Manager, Trade Contractor and any Subcontractors.
C. Agenda:
   1. Execution of Owner-Contractor Agreement.
   2. Submission of executed bonds and insurance certificates.
   3. Distribution of Contract Documents.
   4. Submission of list of subcontractors, list of products, schedule of values, and progress schedule.
   5. Designation of personnel representing the parties in Contract.
   6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, change orders, RFIs and contract closeout procedures
   7. Tentative construction schedule.
   8. Critical work sequencing and long-lead items.
   9. Procedures for testing and inspecting.
   10. Preparation of Record Documents.
   11. Safety Procedures.
   12. Owner's requirements.
   13. Security and housekeeping procedures.
   14. Background Checks.
   15. Responsibility for temporary facilities and controls.
   16. Construction waste management.
   17. Logistics (use of premise, parking, work restrictions, maintain egress, etc.)
D. The Construction Manager is to record minutes and distribute copies within two days after meeting to participants, with one copy to owner, participants, and those affected by decisions made.

3.02 PROGRESS MEETINGS

A. The Construction Manager shall schedule and administer meetings throughout progress of the work at weekly intervals.
B. The Construction Manager is to make arrangements for meetings, prepare agenda with copies for participants, and preside at meetings, record minutes and distribute copies within two days to those affected by decisions made.
C. Attendees may include: Project superintendent, major subcontractors and suppliers, Owner, Construction Manager, Architect/Engineer, as appropriate to agenda topics for each meeting.

All participants at the conference call shall be familiar with the Project and authorized to conclude matters relating to the Work.

D. Agenda:
   1. Review minutes of previous meetings.
   2. Review the Construction Manager's Construction Schedule.
   3. Field observations, problems, and decisions.
   4. Identification of problems that impede planned progress.
   5. Review of submittals schedule and status of submittals.
   6. Review of RFI's.
   7. Review of off-site fabrication and delivery schedules.
   8. Corrective measures to regain projected schedules.
   9. Planned progress during succeeding work period.
   10. Coordination of projected progress.
   11. Maintenance of quality and work standards.
   12. Effect of proposed changes on progress schedule and coordination.
   13. Other business relating to work.
   14. Access, temporary facilities and controls, housekeeping and progress cleaning.
   15. Safety.
   16. Status of proposal requests, pending changes, official Change Orders.

E. Minutes:
   1. Following the meeting, the meeting minutes will be published in Procore by the Construction Manager for all parties.

3.03 COORDINATION MEETINGS

A. Coordination meetings will be held at the discretion of the construction manager.

3.04 REQUESTS FOR INTERPRETATION (RFIs)

A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, prepare and submit an RFI in Procore.
   1. RFIs shall originate with Trade Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
   2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in the Work.

B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:
   1. Specification Section number and title and related paragraphs, as appropriate.
   2. Drawing number and detail references, as appropriate.
   3. Field dimensions and conditions, as appropriate.
   4. Trade Contractor's suggested solution(s). If Trade Contractor's solution(s) impact the Contract Time or the Contract Sum, Trade Contractor shall state impact in the RFI.
   5. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.

C. Design Professional's Action: Design Professional will review each RFI, determine action required, and return it. Allow seven (7) working days for Design Professional's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day. The following RFIs will be returned without action:
   1. Requests for approval of submittals.
   2. Requests for approval of substitutions.
   3. Requests for coordination information already indicated in the Contract Documents.
   4. Requests for adjustments in the Contract Time or the Contract Sum.
   5. Requests for interpretation of Design Professional's actions on submittals.
   6. Incomplete RFIs or RFIs with numerous errors.
   7. Design Professional's action may include a request for additional information, in which case Design Professional's time for response will start again.

D. Design Professional's action on RFIs that may result in a change to the Contract Time or the Contract Sum/Price.
    1. If Trade Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Construction Manager in writing within ten (10) days of receipt of the RFI response.
E. On receipt of Design Professional's response in Procore, review the response and notify Design Professional within seven (7) days if Trade Contractor disagrees with response.

3.05 BACKGROUND CHECKS

A. Background checks must be performed on all on site employees, including sub-contractors.
B. The Contractor hereby explicitly authorized the Iowa DAS to conduct criminal history and/or other background investigation(s) of the Contractor, its officers, supervisory personnel, employees, and other staff retained by the Contractor or their sub-contractors for the performance of the contract.
C. A state of Iowa record check request form will be provided at the pre-construction meeting. Information required may include:
    1. Last Name
    2. First Name
    3. Middle Name
    4. Date of Birth
    5. State Driver’s License or State ID #
    6. Social Security #

3.06 UTILITY LOCATES/GROUND PENETRATIONS

A. Call Iowa One Call at 800-292-8989 to request a locate
    1. Requests must be at least five (5) working days prior to ground penetration.
B. Private utility locates will be provided by facility. Contractor will not pay for locates on PRIVATE lines.

END OF SECTION

SECTION 01 3100.01

WEB BASED CONSTRUCTION MANAGEMENT

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Owner and Contractor shall utilize **Procore Technologies, Inc. Procore** system for electronic submittal of all data and documents (unless specified otherwise by the owner's representative) throughout the duration of the Contract. **Procore** is a web-based electronic media site that is hosted by **Procore Technologies, Inc.**, utilizing their **Procore** web solution. **Procore** will be made available to all contractors' project personnel, subcontractor personnel, suppliers, consultants and the Designer of Record. The joint use of this system is to facilitate; electronic exchange of information, automation of key processes, and overall management of the contract. **Procore** shall be the primary means of project information submission and management. When required by the Owners representative, paper documents will also be provided. In the event of discrepancy between the electronic version and paper documents, the paper documents will govern. **Procore** is a registered trademark of **Procore Technologies, Inc.**

1.02 USER ACCESS LIMITATIONS

A. The Owner's Representative/Construction Manager will control the Contractor's access to **Procore** by allowing access and assigning user profiles to accepted Contractor personnel. User profiles will define levels of access into the system, determine assigned function-based authorizations (determines what can be seen) and user privileges (determines what they can do). Sub-contractors and suppliers will be given access to **Procore** through the Contractor. Entry of information exchanged and transferred between the Contractor and its sub-contractors and suppliers on **Procore** shall be the responsibility of the Contractor.
   1. Joint Ownership of Data: Data entered in a collaborative mode (entered with the intent to share as determined by permissions and workflows within the **Procore** system) by the Owner's Representative and the Contractor will be jointly owned.

1.03 AUTOMATED SYSTEM NOTIFICATION AND AUDIT LOG TRACKING

A. Review comments made (or lack thereof) by the Owner on Contractor submitted documentation shall not relieve the Contractor from compliance with requirements of the Contract Documents. The Contractor is responsible for managing, tracking, and documenting the Work to comply with the requirements of the Contract Documents. Owner's acceptance via automated system notifications or audit logs extends only to the face value of the submitted documentation and does not constitute validation of the Contractor's submitted information.

1.04 SUBMITTALS

A. See Section 01 3300 SUBMITTAL PROCEDURES:
B. Preconstruction Submittals
   1. List of Contractor's key **Procore** personnel. Include descriptions of key personnel's roles and responsibilities for this project. Contractor should also identify their organization's administrator on the list.

1.05 COMPUTER REQUIREMENTS

A. The Contractor shall use computer hardware and software that meets the requirements of the **Procore** system as recommended by **Procore Technologies, Inc.** to access and utilize **Procore**. As recommendations are modified by **Procore**, the Contractor will upgrade their system(s) to

meet the recommendations or better. Upgrading of the Contractor's computer systems will not be justification for a cost or time modification to the Contract. The contractor will ensure that connectivity to the **Procore** system (whether at the home office or job site) is accomplished through DSL, cable, T-1 or wireless communications systems. The minimum bandwidth requirement for using the system is 128kb/s. It is recommended a faster connection be used when uploading pictures and files into the system. **Procore** supports the current and prior two major versions of Chrome, Firefox, Internet Explorer, and Safari.

B. The Contractor shall be responsible for the validity of their information placed in **Procore** and for the abilities of their personnel. Accepted users shall be knowledgeable in the use of computers, including Internet Browsers, email programs, cad drawing applications, and Adobe Portable Document Format (PDF) document distribution program. The Contractor shall utilize the existing forms in **Procore** to the maximum extent possible. If a form does not exist in **Procore** the Contractor must include a form of their own or provided by the Owner representative as an attachment to a submittal. Adobe PDF documents will be created through electronic conversion rather than optically scanned whenever possible. The Contractor is responsible for the training of their personnel in the use of **Procore** (outside what is provided by the owner) and the other programs indicated above as needed.

C. User Access Administration: Provide a list of Contractor's key **Procore** personnel for the Owner's Representative acceptance. Contractor is responsible for adding and removing users from the system. The Owners Representative reserves the right to perform a security check on all potential users. The Contractor will be allowed to add additional personnel and sub-contractors to **Procore.**

1.06 CONNECTIVITY PROBLEMS

A. **Procore** is a web-based environment and therefore subject to the inherent speed and connectivity problems of the Internet. The Contractor is responsible for its own connectivity to the Internet. **Procore** response time is dependent on the Contractor's equipment, including processor speed, Internet access speed, etc. and current traffic on the Internet. The Owner will not be liable for any delays associated from the usage of **Procore** including, but not limited to: slow response time, down time periods, connectivity problems, or loss of information. The contractor will ensure that connectivity to the **Procore** system (whether at the home office or job site) is accomplished through DSL, cable, T-1 or wireless communications systems. The minimum bandwidth requirement for using the system is 128kb/s. It is recommended a faster connection be used when uploading pictures and files into the system. Under no circumstances shall the usage of the **Procore** be grounds for a time extension or cost adjustment to the contract.

1.07 TRAINING

A. The Construction Manager shall provide the necessary training to the Prime Contractor.

PART 2 - PRODUCTS

2.01 DESCRIPTION

A. **Procore** project management application (no equal) Provided by Procore Technologies, Inc. www.**Procore**.com

PART 3 - EXECUTION

3.01 PROCORE UTILIZATION

A. **Procore** shall be utilized in connection with submittal preparation and information management required by Sections:
   1. PROJECT MANAGEMENT AND COORDINATION

2. CONSTRUCTION PROGRESS DOCUMENTATION
3. SUBMITTAL PROCEDURES
4. QUALITY REQUIREMENTS
5. Other Division One sections.
6. Requirements of this section are in addition to requirements of all other sections of the specifications.

B. Design Document Submittals
1. All design drawings and specifications shall be submitted as cad .dwg files or PDF attachments to the **Procore** submittal work flow process and form.

C. Shop Drawings
1. Shop drawing and design data documents shall be submitted as cad .dwg files or PDF attachments to the **Procore** submittal work flow process and form. Examples of shop drawings include, but are not limited to:
2. Standard manufacturer installation drawings.
3. Drawings prepared to illustrate portions of the work designed or developed by the Contractor.
4. Steel fabrication, piece, and erection drawings.

D. Product Data
1. Product catalog data and manufacturer's instructions shall be submitted as
2. PDF attachments to the **Procore** submittal work flow process and form. Examples of product data include, but are not limited to:
3. Manufacturer's printed literature.
4. Preprinted product specification data and installation instructions.

E. Samples
1. Sample submittals shall be physically submitted as specified in Section 01 3300 SUBMITTAL PROCEDURES. Contractor shall enter submittal data information into **Procore** with a copy of the submittal form(s) attached to the sample. Examples of samples include, but are not limited to:
2. Product finishes and color selection samples.
3. Product finishes and color verification samples.
4. Finish/color boards.
5. Physical samples of materials.

F. Administrative Submittals
1. All correspondence and pre-construction submittals shall be submitted using **Procore**. Examples of administrative submittals include, but are not limited to:
2. Digging permits and notices for excavation.
3. List of product substitutions
4. List of contact personnel.
5. Notices for roadway interruption, work outside regular hours, and utility cut overs.
6. Requests for Information (RFI).
7. Construction progress Schedules and associated reports and updates.
   a. Each schedule submittal specified in CONSTRUCTION PROGRESS DOCUMENTATION shall be submitted as a native backed-up file (.PRX or .STX) of the scheduling program being used. The schedule will also be posted as a PDF file in the format.
8. Plans for safety, demolition, environmental protection, and similar activities.
9. Quality Control Plan(s), Testing Plan and Log, Quality Control Reports, Production Reports, Quality Control Specialist Reports, Preparatory Phase Checklist, Initial Phase Checklist, Field Test reports, Summary reports, Rework Items List, etc.
10. Meeting minutes for quality control meetings, progress meetings, pre-installation meetings, etc.

11. Any general correspondence submitted.

G. Compliance Submittals
   1. Test reports, certificates, and manufacture field report submittals shall be submitted on **Procore** as PDF attachments. Examples of compliance submittals include, but are not limited to:
      a. Field test reports.
      b. Quality Control certifications.
      c. Manufacturer's documentation and certifications for quality of products and materials provided.

H. Record and Closeout Submittals
   1. Operation and maintenance data and closeout submittals shall be submitted on **Procore** as PDF documents during the approval and review stage as specified, with actual set of documents submitted for final. Examples of record submittals include, but are not limited to:
      a. Operation and Maintenance Manuals: Final documents shall be submitted as specified.
      b. As-built Drawings: Final documents shall be submitted as specified.
      c. Extra Materials, Spare Stock, etc.: Submittal forms shall indicate when actual materials are submitted.

I. Financial Submittals
   1. Schedule of Value, Pay Applications and Change Request Proposals shall be submitted on **Procore.** Supporting material for Pay Applications and Change Requests shall be submitted on **Procore** as PDF attachments. Examples of compliance submittals include, but are not limited to:
      a. Contractors Schedule of Values
      b. Contractors Monthly Progress Payment Requests
      c. Contract Change proposals requested by the project owner

END OF SECTION

SECTION 01 3200

CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - **GENERAL**

1.01 **SECTION INCLUDES**

A. Construction Progress Schedule
B. Construction Manager's Construction Schedule
C. Submittal Schedule
D. Daily Construction Reports
E. Progress Photographs

PART 2 - **PRODUCTS – NOT USED**

PART 3 - **EXECUTION**

3.01 **CONSTRUCTION MANAGER'S MASTER CONSTRUCTION SCHEDULE**

A. Upon award of package, Contractor agrees to accept and meet or improve upon the schedule proposed in section **00 3113 PRELIMINARY SCHEDULE** with intermediate handoffs. Each package contractor will be required to participate in schedule coordination meetings with the Construction Manager.
B. If the bid package contractor does not meet the handoff milestones in the master construction schedule, the bid package contractor shall take measures to increase work forces, increase work hours, initiate revisions to means and methods of construction, and/or other similar measures as required to make up lost time and complete the work in accordance with the construction schedule and remain consistent with project progress and overall construction schedule. Such measures shall be at no additional cost to the Owner. The Construction Manager shall have sole discretion on decisions to accelerate work.
C. Updating the master construction schedule – Contractors are required to attend and participate in schedule coordination update meetings with the Construction Manager. This will be an opportunity for contractors to further define their scheduled scope of work in conjunction with other trades on site.
D. Acceptance of revised master construction schedule – After an updated master construction schedule has been issued via Procore, Contractors will have 48 hours to dispute the new schedule. All contractors will be held to the last fully accepted master construction schedule.

3.02 **CONSTRUCTION PROGRESS SCHEDULE**

A. Submit preliminary outline to the Construction Manager no later than 48 hours prior to the pre-construction meeting for coordination with Owner's requirements.
B. Submit revised progress schedule with each application for payment.
C. Schedules will be electronically submitted through Procore.
D. Distribute copies of reviewed schedules to project site file, subcontractors, suppliers, and other concerned parties.
E. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.
F. Submit computer generated horizontal bar chart with separate line for each major portion of work or operation, identifying the first day of each week.
G. Show complete sequence of construction activity, identifying work of separate stages and other logically grouped activities. Indicate early and late start, early and late finish, float dates, and duration.
H. Indicate estimated percentage of completion for each item of work at each submission.
I. Participate in joint review and evaluation of schedule with Construction Manager.

J. Revisions to schedules:
   1. Indicate progress of each activity to date of submittal and projected completion date of each activity.
   2. Identify activities modified since previous submittal, major changes in scope, and other identifiable changes.
   3. Prepare narrative report to define problem areas, anticipate delays, and impact on schedule. Report corrective action taken, or proposed, and its effect including effect of changes on schedules of separate contractors.

3.03 SUBMITTAL SCHEDULE

A. Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, re-submittal, ordering, manufacturing, fabrications, and delivery when establishing dates.
   1. Coordinate submittal schedule with list of subcontractors, the schedule of values, and construction schedule.
   2. Submit concurrently with first complete submittal of contractor's construction schedule.

3.04 DAILY CONSTRUCTION REPORTS

A. Daily Construction Reports: Submitted at weekly intervals.
   1. Daily Construction Reports will be submitted to Construction Manager.
B. Prepare a daily construction report recording the following information concerning events at project site:
   1. Count of personnel at Project site
   2. Equipment at Project site
   3. Material Deliveries
   4. High and low temperatures and general weather conditions, including presence of rain or snow
   5. Accidents
   6. Meetings and significant decisions
   7. Unusual events
   8. Stoppages, delays, shortages, and losses
   9. Meter readings and similar recordings
   10. Emergency procedures
   11. Orders and requests of authorities having jurisdiction
   12. Change orders received and implemented
   13. Services connected and disconnected
   14. Equipment or system tests and startups
   15. Partial completions and occupancies
   16. Substantial completions authorized

3.05 PROGRESS PHOTOGRAPHS

A. Progress photographs will be electronically submitted through Procore.
B. Preconstruction Photographs: Before starting construction, take photographs of project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Construction manager.
   1. Take additional photographs as required to record existing damage to site, structure, equipment, or finishes.
C. Periodic Construction Photographs: Take photographs at regular intervals. Select vantage points to show status of construction and progress since last photographs were taken.

D. Field Completion Construction Photographs: Take photographs after date of Substantial Completion for submission as project record documents. Construction manager will inform of desired vantage points.

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SECTION 01 3300

SUBMITTAL PROCEDURES

PART 1 - **GENERAL**

1.01 **SECTION INCLUDES**

A. Submittals for Review
B. Submittals for Information
C. Submittal Procedures
D. Samples

PART 2 - **PRODUCTS – NOT USED**

PART 3 - **EXECUTION**

3.01 **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 Construction Manager to forward to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
C. Samples will be reviewed only for aesthetic, color, or finish selection.
D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record document purposes.

3.02 **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 Construction Manager, Architect, and Owner's knowledge. No action will be taken.

3.03 **SUBMITTAL PROCEDURES**

A. Submittals will be electronically submitted through Procore. Contractor will be invited to join web based program after issue of Notice of Intent to award.
B. Shop Drawing Procedures:
   1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting the Contract Documents and coordinating related Work.
   2. Do not reproduce the Contract Documents to create shop drawings.
   3. Generic, non-project specific information submitted as shop drawings do not meet the requirements for shop drawings.
C. Transmit each submittal with a copy of approved submittal form.

D. Sequentially number the submittal form. Revise submittals with original number and a sequential numeric suffix.
E. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy.
F. 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.
G. Schedule submittals to expedite the project and coordinate submission of related items.
H. For each submittal review, allow 15 days excluding delivery time to and from the contractor.
I. Identify variations from the Contract Documents and product or system limitations that may be detrimental to successful performance of the completed work.
J. When revised for resubmission, identify all changes made since previous submission.
K. Distribute reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.
L. Submittals not requested will not be recognized or processed.

3.04 **SAMPLES**

A. Submit to Construction Manager to forward to Architect/Engineer for review for limited purpose for checking conformance with information given and design concept expressed in the Contract Documents.
B. Samples for selection as specified in product sections:
    1. Submit to Construction Manager to forward to Architect/Engineer for aesthetic, color, or finish selections.
    2. Submit samples of finishes from full range of manufacturer's standard colors, textures, and patterns to Construction Manager to forward to Architect/Engineer for selection.
C. Submit samples to illustrate functional and aesthetic characteristics of products, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
D. Include identification on each sample, with full project information.
E. Submit number of samples specified in individual specification sections.
F. Photograph of submitted samples, along with transmittal sheet, shall be uploaded as a submittal in Procore.

END OF SECTION

SECTION 01 4000

QUALITY REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. References
B. Quality assurance and control of installation
C. Tolerances
D. Defect Assessment
E. Inspection and testing laboratory services
F. Manufacturer's field services and reports

1.02 REFERENCES

A. Conform to reference standard in effect at date of contract.
B. When required by contract documents, obtain copies of standards.
C. Should specified reference standards conflict with contract documents request clarification from engineer before proceeding.
D. The contractual relationship of the parties to the contract shall not be altered from the contract documents by mention or inference otherwise in any reference document.

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.01 QUALITY ASSURANCE/CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship to produce work of specified quality.
B. Comply fully with manufacturer's instructions, including each step in sequence.
C. Should manufacturer's instructions conflict with contract documents, request clarification from the engineer prior to proceeding.
D. Comply with specified standards as a minimum quality for the work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
E. Perform work by persons qualified to produce workmanship of 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 stress, vibration, physical distortion, or disfiguration.

3.02 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable work. Do not permit tolerances to accumulate.
B. Comply with manufacturers’ tolerances. Should manufacturers’ tolerances conflict with contract documents, request clarification from Architect before proceeding.
C. Adjust products to appropriate dimensions; position before securing products in place.

3.03 DEFECT ASSESSMENT

A. Replace work or portions of work not conforming to specified requirements.

B. If, in the option of the Owner, it is not practical to remove and replace the work, Architect will direct an appropriate remedy or recommend adjusted payment.

3.04 INSPECTION AND TESTING

A. Owner shall include and pay for all required special inspections and testing required by IBC Section 1705, if applicable. This does not include inspections and testing required by other specification sections in this Project Manual. Copies of all testing and inspection reports shall be submitted to the Construction Manager and Design Professional by the testing and inspection agency.

B. Testing Agency Duties:
   1. Provide qualified personnel at site. Cooperate with Architect, Construction Manager, 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. Immediately notify the Construction Manager and contractor of observed irregularities or non-conformance of work or products.
   5. Perform additional testing and inspections required by the Owner

C. Limits on Testing Agency/Inspection Agency Authority:
   1. Agency may not release, revoke, alter, or enlarge on requirement of contract documents.
   2. Agency may not approve or accept any portion of the work.
   3. Agency may not assume any duties of the contractor.
   4. Agency has no authority to stop the work.

D. Contractor responsibilities:
   1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.
   2. Cooperate with laboratory personnel, and provide access to the work and to manufacturer’s 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 test/inspections.
      d. To provide storage and curing of test samples.
   4. Notify Construction Manager and laboratory 24 hours prior to expected time for operations requiring testing/inspection.

E. Re-testing required because of non-conformance to specified requirements shall be performed by the same testing agency on instruction by Architect/Construction Manager.

F. Re-testing required because of non-conformance to specified requirements shall be paid for by the Contractor.

3.05 MANUFACTURER'S FIELD SERVICES AND REPORTS

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

B. Individuals are to report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to the manufacturers' written instructions.

C. Submit report in duplicate within 30 days of observation to Construction Manager for review.

END OF SECTION

SECTION 01 5000

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Temporary Utilities
B. Temporary Sanitary Facilities
C. Telephone Service
D. Removal of Utilities, Facilities, and Controls
E. Temporary Facilities
F. Equipment
G. Vehicular Access and Parking
H. Traffic Regulation
I. Barriers
J. Enclosures and Fencing
K. Waste Removal

1.02 TEMPORARY UTILITIES

A. Owner will provide the following:
   1. Electrical Power, consisting of connection to existing facilities.
   2. Water Supply, consisting of connection to existing facilities.
B. The Contractor shall pay for installation, maintenance, and removal of temporary utilities. Temporary utilities shall not disrupt the Facility's need for continuous service.

1.03 TEMPORARY SANITARY FACILITIES

A. Provided by Construction Manager.

1.04 TELEPHONE SERVICE

A. Provide, maintain, and pay for telephone service to field or use a cellular telephone.

1.05 REMOVAL OF UTILITIES, FACILITIES AND CONTROLS

A. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

PART 2 - PRODUCTS

2.01 TEMPORARY FACILITIES

A. Field Offices: Coordinate with Construction Manager and Owner if applicable.

2.02 EQUIPMENT

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

PART 3 - EXECUTION

3.01 VEHICULAR ACCESS AND PARKING

A. Use designated existing on-site roads for construction traffic.
B. Parking is as directed by Owner.
C. When site space is not adequate, provide additional off-site parking.
D. Use of designated existing on-site streets and driveways used for construction traffic is permitted. Track vehicles not allowed on paved areas.
E. Use of designated areas of existing parking facilities used by construction personnel as permitted.
F. Do not allow heavy vehicles or construction equipment in parking areas.
G. Provide and maintain access to fire hydrants, free of obstructions.
H. Provide means of removing mud from vehicle wheels before entering streets.

3.02 TRAFFIC REGULATION

A. Flag Persons: Provide trained and equipped flag persons to regulate traffic when construction operations or traffic encroach on public traffic lanes.
B. Flares and lights: Use flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.
C. Haul Routes:
    1. Consult with authority having jurisdiction, establish public thoroughfares to be used for haul routes and site access.
D. Removal:
    1. Remove equipment and devices when no longer required.
    2. Repair damage caused by demolition.

3.03 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 during construction operations.
B. Provide barricades and covered walkways required by governing authorities for public rights-of-way.
C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

3.04 ENCLOSURES AND FENCING

A. The construction manager will provide fencing and granular surfacing for the lay-down area.

3.05 WASTE REMOVAL

A. Except for items or materials to be salvaged, recycled or otherwise reused, remove waste materials from project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
    1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
    2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
B. Burning: Do not burn waste materials.
C. Waste Disposal Facilities: Provide waste collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction.

END OF SECTION

SECTION 01 6000

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. General product requirements
B. Product options
C. Maintenance materials
D. Transportation and handling
E. Storage and protections

PART 2 - PRODUCTS

2.01 GENERAL PRODUCT REQUIREMENTS

A. Provide new products unless specifically required or permitted by the contract documents.
B. Do not use products having any of the following characteristics:
    1. Made using or containing CFC's or HCFC's
    2. Made of wood from newly cut old growth timber.
C. Where all 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
    3. Are extracted, harvested, and/or manufactured closer to the location of the project
    4. Have longer documented life span under normal used
    5. Result in less construction waste
    6. Are made of vegetable materials that are rapidly renewable

2.02 PRODUCT OPTIONS

1. Products specified by reference standards or by description only: Use of any product meeting those standards or description.
2. Products specified by naming one or more manufacturers, with or without a provision for substitutions: Use a product of one of the manufacturers named and meeting specifications or submit a request for substitution for any manufacturer not named by the date specified in this project manual. Substitution requests shall be emailed to the Issuing Officer at the email address provided in Instructions to Bidders Section 1.04.

2.03 MAINTENANCE MATERIALS

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

PART 3 - EXECUTION

3.01 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.
B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.
C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. Transport and handle products in accordance with manufacturer's instructions.
E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.
H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.02 STORAGE AND PROTECTIONS

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.
B. Store and protect products in accordance with manufacturers' instructions.
C. Store with seals and labels intact and legible.
D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to the product.
E. For exterior storage of fabricated products, place on slopped 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 manufacturers' warranty conditions, if any.
H. Cover product subject to deterioration with impervious sheet covering. Provide 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. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

END OF SECTION

SECTION 01 7300

EXECUTION

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures
B. Alteration project procedures
C. Cutting and patching
D. Cleaning and protection
E. Adjusting

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.01 EXAMINATION, PREPARATION, AND GENERAL INSTALLATION PROCEDURES

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 misproduction.
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; include 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. Clean substrate surfaces prior to applying next material or substance.
H. Seal cracks or openings of substrate prior to applying next material or substance.
I. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.
J. 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.
K. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
L. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
M. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
N. Make neat transitions between different surfaces, maintaining texture and appearance.

3.02 ALTERATION PROJECT PROCEDURES

A. Materials: As specified in product sections match existing products and work for patching and extending work.
B. Employ skilled and experienced installer to perform alteration work.
C. Close openings in exterior surfaces to protect existing work from weather and extremes of temperature and humidity.
D. Remove unsuitable material not marked for salvage, including rotted wood, corroded metals, and deteriorated masonry and concrete. Replace materials as specified for finished work.
E. Remove, cut and patch work in a manner to minimize damage and to provide a means of restoring products and finished to original condition.

F. Remove debris and abandoned items from area and from concealed spaces.
G. Refinish visible existing surfaces to remain in renovated rooms and spaces to specified condition for each material with a neat transition to adjacent finishes.
H. Where new work abuts or aligns with existing, perform a smooth and even transition. Patched work to match existing adjacent work in texture and appearance.
I. When finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line of division and make recommendation to the Construction Manager. Prior to cutting get the Owner's approval.
J. Where change of plane of ¼ inch or more occurs, submit recommendation for providing smooth transition to the Construction Manager for review.

3.03 CUTTING AND PATCHING

A. Employ skilled and experienced installer to perform cutting and patching.
B. Submit written request in advance of cutting or altering elements which affect:
   1. Structural integrity of element.
   2. Integrity of weather-exposed or moisture-resistant elements.
   3. Efficiency, maintenance, or safety of element.
   4. Visual qualities of sight exposed elements.
   5. Work of owner or separate contractor.
C. Execute cutting, fitting, and patching to complete work, and to:
   1. Fit the several parts together, to integrate with other work.
   2. Uncover work to install or correct ill-timed work.
   3. Remove and replace defective and non-conforming work.
   4. Remove samples of installed work for testing.
   5. Provide openings in elements of work for penetrations of mechanical and electrical work.
D. Execute work by methods to avoid damage to other work and which will provide proper surfaces to receive patching and finishing.
E. Cut rigid materials using masonry saw or core drill.
F. Cut masonry and concrete materials using masonry saw or core drill.
G. Restore work with new products in accordance with requirements of Contract Documents.
H. Fit work tight to pipes, sleeves, ducts, conduit and other penetrations through surfaces.
I. Maintain integrity of wall, ceiling or floor construction; completely seal voids.
J. Refinish surfaces to match adjacent finishes. Refinish to nearest intersection for continuous surfaces. Refinish entire unit for continuous surfaces for an assembly.
K. Identify hazardous substances or conditions exposed during the work to the engineer for decision or remedy.

3.04 CLEANING AND PROTECTION

A. Progress cleaning
   1. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
   2. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.
B. Protection of installed work
   1. Protect installed work from damage by construction operations.
   2. Provide special protection where specified in individual specification sections.
   3. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
   4. Remove protective coverings when no longer needed; reuse or recycle plastic coverings if possible.
   5. Prohibit traffic from landscaped areas.

3.05 ADJUSTING

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

END OF SECTION

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SECTION 01 7700

CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Inspections
B. Substantial Completion
C. Project Record Documents
D. Warranties
E. Operations and Maintenance Manuals
F. Operations and Maintenance Data for Materials and Finishes
G. Operations and Maintenance Data for Equipment and Systems
H. Training
I. Final Completion
J. Maintenance

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.01 INSPECTIONS

A. Ensure all state inspections have been completed by the authority having jurisdiction.
B. Upload documentation of all test/inspections to Procore.
C. Submit a written request for inspection of Substantial Completion. On receipt of request, The Design Professional will either proceed with inspection or notify contractor of unfulfilled requirements. The Design Professional will prepare the Certificate of Substantial Completion after inspection or will notify contractor of items, either on contractor's list or additional items identified by architect that must be completed or corrected before certificate will be issued.
    1. Re-inspection: Request re inspection when the work identified in previous inspections as incomplete is completed or corrected.
    2. Results of completed inspection will form the basis of requirements for Final Completion.

3.02 SUBSTANTIAL COMPLETION

A. A substantial completion checklist is attached for reference following this specification section.
B. Make submittals that are required by governing or other authorities.
    1. Provide copies to the Construction Manager through upload to Procore.
C. Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
    1. Submit written certification that contract documents have been reviewed, work has be inspected, and that work is completed in accordance with contract documents and ready for review
    2. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the work has not been completed.
    3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
    4. Make final changeover of permanent locks and deliver key to the owner. Advise owner's personnel of changeover in security provisions.
    5. Complete startup testing of systems.
    6. Submit test/adjust, balance records.
    7. Terminate and remove temporary facilities from project site, along with mockups, construction tools, and similar elements.

8. Advise owner of changeover in heat and other utilities.
9. Submit changeover information related to owner's occupancy, use, operation, and maintenance.
10. Complete final cleaning requirements, including touch up painting.
11. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

3.03 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the work:
   1. Drawings
   2. Specifications
   3. Addenda
   4. Change orders and other modifications to the contract
   5. Reviewed shop drawings, product data, and samples
B. Ensure entries are complete and accurate, enabling future reference by Owner.
C. Store record documents separate from documents used for construction.
D. Record information concurrent with construction progress, not less than weekly.
E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
   1. Manufacturer’s name and product model and number.
   2. Product substitutions or alterations utilized.
   3. Changes made by Addenda and modifications.
F. Record Drawings:
   1. Measured depths of foundations in relation to finish first floor datum.
   2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
   3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the work.
   4. Field changes of dimension and detail.
   5. Details not on original contract drawings.
G. Record Drawings shall be uploaded to Procore in pdf format.

3.04 WARRANTIES

A. Submit written warranties for designated portions of the work where commencement of warranties other than date of Substantial Completion is indicated.
B. Submit properly executed warranties in Procore prior to Final Completion.
C. Verify that documents are in proper form, contain full information, and are notarized.
D. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
E. Include warranties in operation and maintenance manuals.
F. Items of work delayed beyond date of Substantial Completion, provide updated submittal after acceptance by Owner, listing date of acceptance as start of warranty period

3.05 OPERATIONS AND MAINTENANCE MANUALS

A. Format: Submit operations and maintenance manuals in the following format:
   1. Portable Document Format (PDF) electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Owner and upload to Procore.
      a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.

2. Assemble with data arranged in the same sequence as, and identified by the specification sections. Where systems involve more than one specification section, provide separate index for each system.
3. Include project directory listing title and address of project, names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.
4. Include Table of Contents listing every item separated by index and specification section.

B. 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.

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

D. 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.

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

3.06 OPERATIONS 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 specified products.

3.07 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 replacement 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 specified 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 procedure and guide for preventative maintenance and troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

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. Provide control diagrams by controls manufacturer as installed.
L. Provide contractor's coordination drawings, with color coded piping diagrams as installed.
M. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
N. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
O. Include test and balancing reports.
P. Additional requirements: As specified in individual specification sections.

3.08 TRAINING

A. Demonstrate operations of systems, subsystems, and equipment.
B. Train in operation and maintenance of systems, subsystems, and equipment
C. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.
D. Submit written agenda to Construction Manager for approval prior to scheduling training.
E. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

3.09 FINAL COMPLETION

A. A final completion checklist is attached for reference following this specification section.
B. Before requesting final inspection for determining date of Final Completion, complete the following:
    1. Complete punch list items.
    2. Prepare and submit project record documents, operation and maintenance manuals, damage or settlement surveys, and similar final record information.
    3. Deliver tools, spare parts, extra materials, and similar items to location designated by owner. Label with manufacturer's name and model number where applicable.
    4. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
    5. All trailers, construction signs, unused, broken or demolition materials have been removed from the site and the premises returned to the original condition in the opinion of the Owner and Design Professional.
    6. Submit a final Application for Payment (retainage).
C. Upon receipt of final payment complete final completion certificate in Procore.

END OF SECTION

Substantial Completion Project Checklist

Date: _____

DAS Project Number: _____
Project Title: _____
Location: _____
Contractor: _____

In order to process the 99% payment (100% pay app less closeout and retainage) on a Capital Project, the Department of Administrative Services needs the following information. Please complete this form and obtain the necessary documents.

Have all state inspections been completed and documentation uploaded to Procore?
(Including but not limited to the following inspections)

Boiler Inspection	❑ **Yes**	❑ **No**	❑ **N/A**
Water Heater Inspection	❑ **Yes**	❑ **No**	❑ **N/A**
Energy Code Inspection	❑ **Yes**	❑ **No**	❑ **N/A**
Building Code Inspection	❑ **Yes**	❑ **No**	❑ **N/A**
Electrical Inspection	❑ **Yes**	❑ **No**	❑ **N/A**
Elevator Inspection	❑ **Yes**	❑ **No**	❑ **N/A**
Other: _____	❑ **Yes**	❑ **No**	❑ **N/A**

❑ **Occupancy Permit if applicable**

❑ **Test and Balance has been performed**

❑ **Certificate of Substantial Completion in Procore (Consensus Docs 814)**

Are there any disputes with the above mentioned vendor which need resolution?
❑ **Yes (provide description below)** ❑ **No**

_____

_____

Can payment (less closeout and retainage) be released? ❑ **Yes** ❑ **No**

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Final Completion Project Checklist

Date: _____

DAS Project Number: _____
Project Title: _____
Location: _____
Contractor: _____

In order to process the 100% payment and Retainage payment on a Capital Project, the Department of Administrative Services needs the following information. Please complete this form and obtain the necessary documents.

Have all Warranties been received? ❑ Yes ❑ No

Have the Operations and Maintenance Manuals been received? ❑ Yes ❑ No

Who is in possession of the O & M Manuals? _____

Has all training been completed? ❑ Yes ❑ No

Have all as-built drawings been scanned and uploaded into Procore? ❑ Yes ❑ No

Have electronic drawing/specification files been transferred to DAS? ❑ Yes ❑ No

Have all Test & Balance reports been received? ❑ Yes ❑ No

Have all punchlist items been corrected? ❑ Yes ❑ No

❑ **573 Notification** *(To be obtained from the general contractor):* Copy of general contractor's notification of application for retainage to all subcontractors and suppliers. General contractor must follow IAC 26 section 23.13.2.

❑ **AIA Form G706 – Contractor's Affidavit of Payment of Debts and Claims**

❑ **AIA Form G706A – Contractor's Affidavit of Release of Liens**

❑ **AIA Form G707 – Consent of Surety Company to Final Payment**

❑ **Certificate of Final Completion in Procore (Consensus Docs 815)**

Are there any disputes with the above mentioned vendor which need resolution?
❑ Yes (provide description below) ❑ No

_____

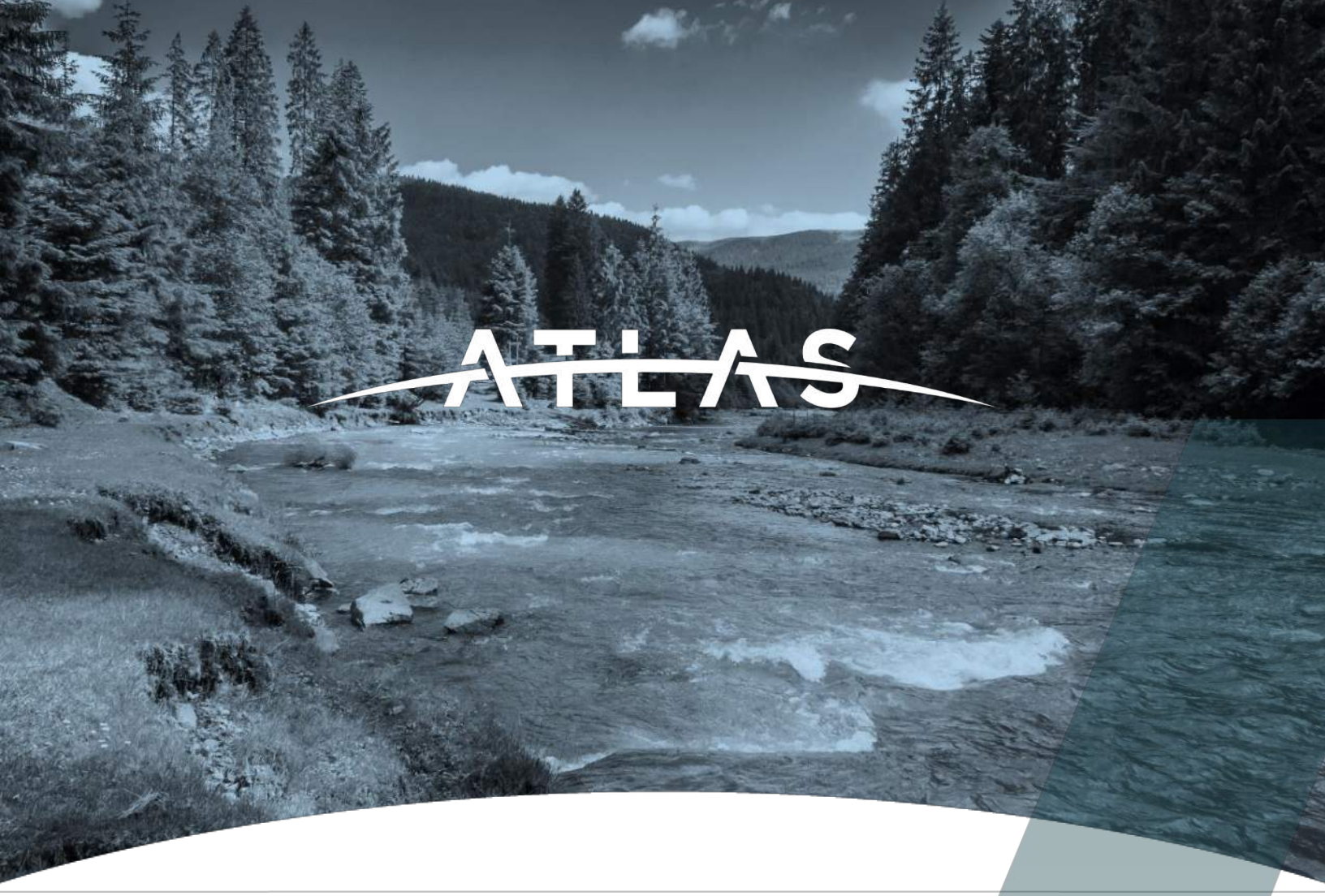
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Can 100% payment and retainage payment be released? ❑ Yes ❑ No

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ASBESTOS ABATEMENT SPECIFICATION

LINDEN A/B AND C/D DECENTRALIZATION, FIRE ALARM AND SPRINKLER PROJECT #9279.40 AND #9279.41

WOODWARD RESOURCE CENTER

1251 334TH STREET

WOODWARD, IOWA

204BS09286 – TASK 02

PREPARED FOR:

Iowa Department of Administrative Services
109 SE 13th Street
Des Moines, Iowa 50319

PREPARED BY:

Atlas Technical Consultants LLC
11117 Mockingbird Drive
Omaha, NE 68137

May 5, 2026

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APPLICABLE PUBLICATIONS

A. The publications listed below form a part of the Section to the extent referenced. The publications area referenced in the text by basic designation only.

1. Title 29 Code of the Federal Regulations, U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) Standards.
   a. Part 1910.95 — Occupational Noise Exposure
   b. Part 1910.134 — Respiratory Protection (most recent revision)
   c. Part 1910 — Toxic and Hazardous Substances: Subpart Permissible Exposure Limits (PELs)
   d. Part 1925.58 — Access to Employee Exposure and Medical Records
   e. Part 1926.1101 — Asbestos in Construction (all applicable sections)
   f. Part 1926.59 — Hazard Communication

2. Title 40 Code of Federal Regulations, U.S. Environmental Protection Agency (EPA) Standards
   a. Part 61, Subpart A — National Emission Standards for Hazardous Air Pollutants, General Provision
   b. Part 61, Subpart M — National Emission Standards for Hazardous Air Pollutants, National Emission Standard for Asbestos; Including Asbestos NESHAP Revision, Final Rule, Federal Register, Tuesday, November 20, 1990

3. Title 49 Code of Federal Regulations, U.S. Department of Transportation (DOT) Standards
   a. Part 171 — Hazardous Substances
   b. Part 172 — Hazardous Materials Tables and Hazardous Materials Communication Subparts B & C Regulations
   c. Part 173, and Subpart M — Shippers- General Requirements for Shipments Packaging

4. Applicable Iowa State Regulations
   a. State of Iowa Department of Public Health

5. National Institute for Occupational Safety and Health (NIOSH) Publication
   a. Manual of Analytical Methods, Method 7400 (Latest Revision)
   b. Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, October 1985

6. American Society for Testing and Materials (ASTM)
   a. Standard Practice for Visual Inspections of Asbestos Abatement Project (latest edition)

7. Applicable Local Regulations
   a. Applicable local asbestos regulations for the removal and/or transportation of asbestos, including Woodbury County and the City of Sioux City, Iowa.

Asbestos Abatement Specification Section 2081

PART 1 - GENERAL

1.1 INTRODUCTION

Asbestos abatement in building spaces is governed by rules established by the State of Iowa. This specification section addresses or references the requirements for complying with Department of Labor (DOL), Iowa Department of Natural Resources (IDNR), Occupation Safety and Health Organization Administration (OSHA), and the United States Environmental Protection Agency (USEPA) National Emission Standards for Hazardous Air Pollutants (NESHAP) asbestos rules. Every rule requirement may not be restated in detail since trained, accredited, and licensed contractors and individuals are required for this work and are presumed to be familiar with the relevant laws and rules. Full regulatory compliance is required, and is a part of the contract, whether specifically stated herein or not.

1.2 APPLICABLE PUBLICATIONS

B. The publications listed below form a part of the Section to the extent referenced. The publications area referenced in the text by basic designation only.

8. Title 29 Code of the Federal Regulations, U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) Standards.
   a. Part 1910.95 — Occupational Noise Exposure
   b. Part 1910.134 — Respiratory Protection (most recent revision)
   c. Part 1910 — Toxic and Hazardous Substances: Subpart Permissible Exposure Limits (PELs)
   d. Part 1925.58 — Access to Employee Exposure and Medical Records
   e. Part 1926.1101 — Asbestos in Construction (all applicable sections)
   f. Part 1926.59 — Hazard Communication

9. Title 40 Code of Federal Regulations, U.S. Environmental Protection Agency (EPA) Standards
   a. Part 61, Subpart A — National Emission Standards for Hazardous Air Pollutants, General Provision
   b. Part 61, Subpart M — National Emission Standards for Hazardous Air Pollutants, National Emission Standard for Asbestos; Including Asbestos NESHAP Revision, Final Rule, Federal Register, Tuesday, November 20, 1990

10. Title 49 Code of Federal Regulations, U.S. Department of Transportation (DOT) Standards
    a. Part 171 — Hazardous Substances
    b. Part 172 — Hazardous Materials Tables and Hazardous Materials Communication Subparts B & C Regulations
    c. Part 173, and Subpart M — Shippers- General Requirements for Shipments Packaging

11. Applicable Iowa State Regulations
    a. State of Iowa Department of Public Health

12. National Institute for Occupational Safety and Health (NIOSH) Publication

a. Manual of Analytical Methods, Method 7400 (Latest Revision)

b. Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, October 1985

13. American Society for Testing and Materials (ASTM)
    a. Standard Practice for Visual Inspections of Asbestos Abatement Project (latest edition)

14. Applicable Local Regulations
    a. Applicable local asbestos regulations for the removal and/or transportation of asbestos, including Woodbury County and the City of Sioux City, Iowa.

1.3 DEFINITIONS

In addition to the terms listed below, all definitions in the laws and regulations listed in Section 1.5 are incorporated by reference, whether or not restated herein.

ACM: Asbestos Containing Materials any material containing greater than one percent (>1%) asbestos by laboratory analysis

Abatement Contractor (AC): the entity responsible for performing the work in this section, and has the training and accreditation to competently perform the work. This entity will obtain and maintain licenses required for the work identified in this section

Asbestos Abatement Supervisor: hereinafter referred to as "supervisor" means any person who supervises asbestos abatement workers. This person must be trained, accredited, and licensed as required, and must also meet OSHA "competent person" criteria for asbestos abatement

Environmental Consultant (EC): is selected by the Owner to serve as the Environmental Project Manager on their behalf. For this project the EC shall be Atlas Technical Consultants LLC

Environmental Project Manager (EPM): is the EC representative to perform environmental monitoring and testing activities on behalf of the Owner on the project, this also shall be Atlas Technical Consultants LLC

HEPA Filter: a High Efficiency Particulate Air filter capable of trapping 99.97% percent of mono-dispersed particles greater than 0.3 micrometers in mass median aerodynamic equivalent diameter

IDNR: the Iowa Department of Natural Resources

NESHAP: the National Emission Standards for Hazardous Air Pollutants

NIOSH: the National Institute for Occupational Safety and Health

OSHA: the Occupational Safety and Health Administration

Owner: the owner of the property and the authority ordering the work specified herein

PCM: Phase Contrast Microscopy
Plasticize: to apply plastic sheeting over surfaces or objects to protect them from contamination or water damage.

PPE (Personal Protective Equipment): protective suits, head and foot covers, gloves, respirators and other items used to protect persons from asbestos or other hazards

SDS: Safety Data Sheet, required by OSHA for any substances which are toxic, caustic, or otherwise hazardous to workers

USEPA: the United States Environmental Protection Agency

Work Area: area or areas where asbestos abatement is being conducted

1.4 SCOPE OF WORK

It is the intent of the Owner to remove the asbestos containing materials identified in Table 1 below.

The materials identified in the tables below are those that are anticipated to be impacted by renovation activities. There are additional ACM that have been identified and are associated with these buildings, please reference the revised Hazardous Building Materials Survey prior to impacting suspect materials.

The following will be completed by the AC as part of the Linden Court abatement project:

- **AC will be responsible for the demolition and disposal of suspended ceiling system in abatement areas of Linden Court A/B and C/D, the ceiling tiles are to be disposed of as ACM waste, the grid may be cleaned and disposed of as non-ACM if the AC chooses,**
- **AC will remove the entire ceiling system above the suspended ceiling in Linden Court A/B and C/D including the asbestos containing ceiling texture, plaster skim coat and wire mesh,**
- **AC will remove HVAC duct work and connecting registers. HVAC ductwork is lined with insulation and must be disposed of as ACM unless there is no insulation and it can be cleaned prior to removal from the containment, and**
- **AC will support conduit and low voltage wiring as described in the Contract Summary, note 09-E029 and remove light fixtures as described in note 09-ED032.**

Linden Court A/B

Asbestos Containing Materials				
Sample Number	**Material**	**Location**	**Approx. Quantity**	**Asbestos Content**
LA-51, 58, 149, 150, 151, 152	Acoustical Ceiling Texture (over plaster and wire lath)	Linden Buildings A and B, **1st and 2nd Floors – Throughout** (above drop ceilings in many locations and assumed above drywall ceilings where height of room or corridor is reduced)	19,250 SF	6-8% Chrysotile
LC-89, 121	TSI – White Sealant (on fiberglass piping)	Basement – B10, B21 Mechanical 1st Floor – 110, 132 Mechanical 2nd Floor – 201, 230 Mechanical	120 SF	3 -5% Chrysotile
SF = Square Feet, LF = Linear Feet, MF – Mechanical Fittings				

Linden Court C/D

Asbestos Containing Materials				
Sample Number	**Material**	**Location**	**Approx. Quantity**	**Asbestos Content**
LD-201, 204, 210, LC-214, 216	Acoustical Ceiling Texture (over plaster and wire lath)	Linden Buildings C and D, **1st and 2nd Floors – Throughout** (above drop ceilings in many locations and assumed above drywall ceilings where height of room or corridor is reduced)	19,250 SF	20-25% Chrysotile
LC-89, 121	TSI – White Sealant (on fiberglass piping)	Basement – B10, B21 Mechanical 1st Floor – 110, 133 Mechanical 2nd Floor – 201, 229 Mechanical	120 SF	3 – 5% Chrysotile
LC-168	Window Glazing	Exterior – Building D, South end of N-S Corridor as Indicated on Drawing	1 Window	2% Chrysotile
SF = Square Feet, LF = Linear Feet, MF – Mechanical Fittings				

Multiple Buildings

Asbestos Containing Materials				
Sample Number	**Material**	**Location**	**Approx. Quantity**	**Asbestos Content**
A-36 – Base Coat A-42	Plaster	Larches, Throughout 1st and 2nd Floors – Ceilings and Walls	Disturbance due to drilling and screw installation of wall mounted electrical boxes and conduit straps in up to 50 locations (contractor can estimate 3-4 drill holes/box and 1-2 for the conduit strap)	<1% Chrysotile
A-7, A-8, A-43, A-51, A-52, A-59, A-64, A-65, A-66, A-67, A-68, A-70, A-71, A-72, A-90, A-92, A-95, A-102	Various ACM Floorings	Floor Coverings throughout Oak Hall, Larches, Maple Lodge, Employee Home and Hemlock	Disturbance of floor coverings due to floor penetrations for conduit installation in up to 10 locations (<1 SF/location) **Please refer to the attached Drawings for locations that floor coverings were not observed to possibly avoid impacting ACM during conduit installation**	2% - 20% Chrysotile
A-7	9" x 9" Floor Tile (brown) and Black Mastic	Oak Hall, 1st Floor: Loading Dock (2 layers), Great Room, North and South Center Stairwells and North Wing Corridor to be abated 5' each side of center line down corridor Oak Hall, 2nd Floor: Great Room, North Center Stairwell and North Wing Corridor to be abated 5' each side of center line down corridor	2,960 SF 980 SF	Tile: 3% Mastic: 2% Chrysotile

Asbestos Containing Materials				
Sample Number	Material	Location	Approx. Quantity	Asbestos Content
Previously Sampled as Part of Tunnels	Thermal Systems Insulation	Oak Hall, Basement – On Piping and Debris on Floor Throughout (entire basement as indicated on drawings to be included in containment)	990 LF of Piping ~8,000 SF of Debris Clean up	7-70% Chrysotile 7-28% Amosite
SF = Square Feet, LF = Linear Feet, MF – Mechanical Fittings				

If the contractor identifies any additional suspect ACM not identified in the original inspections that may be disturbed during the project, stop work and the material(s) will be sampled and analyzed prior to disturbance.

Drawings are provided to identify locations of these materials. All ACM noted on the drawings shall be removed. The contractor is responsible for quantifying the materials in the scope of work during the pre-bid site visit. Any discrepancies of locations or quantities should be brought to the attention of EC as soon as possible and before the bid due date. ACM found inside the work areas, or noted in the drawings, shall be the responsibility of the AC for abatement at no additional cost to the Owner.

1.5 WORK INCLUDED

A. The work includes all labor, equipment, materials, and supplies necessary to perform the scope of work in the documents by the procedures described herein. The contractor, by submitting a bid for the work, represents itself as knowledgeable and expert in the performance of the work, and includes all things usually and customarily necessary to provide a complete and finished job, whether specifically mentioned or not. Related work may be shown in other related documents, prepared by others. Where there is conflict in the documents, written clarification should be requested to the EC.

B. Removal of asbestos-containing material listed in Section 1.3, including pre-cleaning, establishing regulated areas, isolating the work areas, protection of adjacent areas, containment, construction curtain, cleanup and decontamination to the specified clearance levels, proper packaging and disposal of wastes, and all other steps necessary to complete the scope of work.

C. Prior to performing abatement, the Contractor is required to restrict public access and visibility of the work by installing a temporary barrier in front of the staging area. The barrier shall include black poly sheeting and secured to prevent unauthorized access.

D. Exhaust units must be vented to the outside of the building. This may involve the use of additional lengths of flexible duct connected to the unit and routed to the nearest outside opening. When not feasible due to fixed windows, as determined by the EC, negative air machines will be double HEPA filtered. The area receiving the exhaust shall not interfere with building occupant activities. Air monitoring by the EC shall be performed at the final exhaust location of the negative air machine if exhausting to the indoors.

E. Compliance with all applicable laws, regulations, standards, and these specifications. In the case of a conflict, the contractor will comply with the most stringent.

F. Contractor is required to fully comply with these specifications.

G. All licenses, accreditations, permits, fees, notifications, reports, or other documents required by law, regulation, this specification, or the Documents.

H. Provide project closeout documentation to the EC within 30 days after final clearance of each Phase. This documentation shall include, but is not limited to, items listed in Section 1.7, Submittals by the AC.

1.6 LAWS, REGULATIONS AND STANDARDS

A. The following laws, regulations, and standards are incorporated by reference:

1. Iowa Division of Labor (DOL), Iowa Workforce Development
   Iowa Administrative Code (IAC) 875 Chapter 10 (IAC 875-10)
   IAC 875-155

2. Iowa Department of Natural Resources (IDNR)
   IAC 567-23

3. Occupational Safety and Health Administration administered by the Iowa Department of Labor:

29 CFR 1910.134	US OSHA Respiratory Protection
29 CFR 1910	US OSHA General Industry Standards
29 CFR 1926	US OSHA Construction Standards
29 CFR 1926.1101	US OSHA Asbestos Construction Standards
29 CFR 1910.1001	US OSHA Asbestos Standards

4. Environmental Protection Agency NESHAPS regulations administered by the Iowa Department of Natural Resources including:

ASHARA	USEPA Asbestos School Hazard Abatement Reauthorization Act
40 CFR Part 61	USEPA National Emissions Standards for Hazardous Air Pollutants (NESHAP)
40 CFR 763 Subpart E	USEPA Asbestos Hazard Emergency Response Act (AHERA) Rules
40 CFR 763 Subpart E,	USEPA Asbestos Model Accreditation Plan (MAP): Appendix C Interim Final Rule

1.7 ASSESSMENT, MONITORING, TESTING AND ANALYSIS

A. The EPM will be independent of the AC and hired by the State for monitoring the project. The EPM will perform testing, inspection, and monitoring services during the asbestos work and upon its completion. The EPM will be licensed for asbestos, trained for PCM analysis and a participant in a quality control program for proficiency. The monitoring will include the following parameters:

1. On an as needed basis during the work, the EPM shall:
   a. Enter the work area to inspect the work procedures and work area integrity.
   b. Collect air samples outside the work area at the perimeter and at the exhaust of the negative air machine.
   c. The EC will stop the work if airborne asbestos concentrations outside the work area exceed 0.01 f/cc. The work may restart when the source of fiber release has been identified and corrected. Contractor will be responsible for cleaning and decontaminating the outside area if caused by the asbestos abatement activities.

2. Upon completion of the work, the EC shall:
   a. Visually inspect the work area for visible debris and/or gross contamination.
   b. Contractor shall be required to re-clean the area, or portions of areas, until no visible debris and/or gross contamination remains, and the work area is dry.
   c. Clearance testing by PCM will be performed for each work area.

d. Collection and analysis of samples will be conducted in general accordance with NIOSH Method 7400 and the clearance level will not exceed 0.01 f/cc.

e. Preparation and submittal of the Project Report to the Owner within 30 days of project completion and receipt of all waste manifests.

B. The Contractor shall provide OSHA compliance air monitoring to determine exposures to its employees in accordance with OSHA 29 CFR 1926.1101. Frequency of testing will comply with OSHA requirements for the anticipated and actual exposure levels.

1. A written Exposure Assessment is required prior to the start of the work to determine the requirements for respiratory protection and frequency of OSHA monitoring for each type of activity. If the DOL requests additional monitoring and data for the exposure assessment, the testing will be conducted at the expense of the abatement contractor.
2. Analysis may be performed on-site by a trained Air Sampling Professional experienced in the fiber counting methods outlined in NIOSH Method 7400 and supporting training documentation or successful training certificate.

1.8 SUBMITTALS BY THE CONTRACTOR

A. Bid Submittals. The following list of items shall be submitted in whole upon award of the bid. If the following items are not submitted by the Contractor, the bid may be rejected.

1. Contractor must submit a copy of their current unexpired Iowa permit/license to perform asbestos abatement and their Iowa Contractor Registration.
2. Disclosure of past and pending violations in respect to environmental, safety or asbestos rules (State and Federal).

B. All asbestos notifications should be made within the accepted time frame to the Iowa Department of Natural Resources and Iowa Department of Labor as required. Notifications shall be submitted a minimum of 10 working days before commencement of work. A copy of the required submittals shall also be provided to the EC for review prior to submittal to the regulatory agencies.

C. After the project is awarded, the selected Contractor shall provide the following to the EC 10 days prior to commencement of Work:

1. Documentation of arrangements of transport and disposal, and landfill name and location.
2. Contractor must submit a copy of their current unexpired Iowa Asbestos Abatement Worker and Supervisor license for all workers anticipated to be assigned to this project. Worker training documentation, medical examinations, fit tests, certifications and training courses shall also be provided that are relevant to the Project.
4. Drawings or sketches for layout and construction of isolation barriers and decontamination units and type of containments.
5. Respirators: NIOSH approvals and manufacturer certification of P-100 cartridges.
6. Fit test documentation for all employees and the fit test agent.
7. Manufacturers' certifications that all HEPA vacuums, negative air pressure equipment, and other local exhaust ventilation equipment conform to ANSI Z9.2-79
8. OSHA Exposure Assessment, if applicable.

9. Laboratory and analyst credentials for contractor OSHA samples.
10. Safety Data Sheets (SDS) for chemicals used on-site.

D. To the EC weekly during the abatement work:

1. Job progress reports detailing abatement activities, progress compared to schedule, problems and actions taken, injury reports, and equipment breakdowns.
2. Quantity of asbestos materials removed.
3. Waste Shipment Records.
4. Work site Entry logs.
5. Measurement logs for negative pressure differentials for each containment.
6. Filter Change logs for respirators, HEPA vacuums, negative air machines, and other engineering controls.
7. OSHA compliance air monitoring data.
8. Worker license and certification log.

PART 2 - PRODUCTS

2.1 TOOLS AND EQUIPMENT

All equipment shall at least conform to minimum industry standards (i.e. ground-fault circuit interrupter (GFCI)).

A. Equipment:

1. Negative Air Machines shall provide HEPA filtration and conform to ANSI Z9.2 fabrication criteria.
2. Respirators shall be NIOSH approved for use with asbestos or other contaminants anticipated in the work.
3. Contractor is fully responsible for complying with OSHA rules for other safety equipment, such as hard hats, safety harnesses, eye protection, gloves, footwear, and any other safety devices used on the site.

B. Tools:

1. Shovels and scoops shall be metal, rubber or plastic, suitable for use in a plasticized containment.
2. Scrapers, brushes, utility knives and other hand tools shall be of good quality and suitable for the intended uses. The contractor shall keep an ample supply on hand for the completion of the work. If fixed open blade knives are to be used, the proper hand protection shall be utilized (i.e. cut resistant gloves).
3. Power tools such as, but not limited to saws, pneumatic chisels, brushes, sanders, and needle guns shall be equipped with shrouds and HEPA-filtered local exhaust systems to capture released particles.
4. Submit proposed tools and methods to be used for removal.
5. Unsafe tools or improper usage of tools may become prohibited items at the discretion of the Owner's Representative based on safety concerns.

2.2 MATERIALS

A. Installed materials which become a part of the work such as, but not limited to, encapsulants shall be of good quality, non-lead-bearing, free of asbestos, and conform to the respective reinstallation specification sections prepared by others.

1. Contractor shall ensure that encapsulants and sealants used as primers, basecoats, or covering existing materials are compatible with the respective existing or reinstallation materials and their manufacturers' warranties.

B. Abatement materials

1. Polyethylene sheeting for all applications shall be 6-mil nominal thickness for floors, drop cloths, and walls.
2. Tape shall be 2" or 3" duct tape or other waterproof tape suitable for joining poly seams and attaching poly sheeting to surfaces.
3. Spray adhesives shall be non-flammable and free of methylene chloride solvents.
4. Disposal bags shall be 6-mil polyethylene and shall be properly labeled.
5. Disposable suits, hoods, and foot coverings shall be TYVEK® or similar.
6. Solvents shall be compatible with any primers, mastics, adhesives, paints, coatings, or other surfacing materials to be installed following their use.

C. ACCEPTABLE MANUFACTURERS/PRODUCTS: All products must meet or exceed ASTM standards.

PART 3 - EXECUTION

3.1 EMPLOYEE TRAINING, QUALIFICATION AND MEDICAL SCREENING

A. Supervisors and Workers shall be trained, accredited, and licensed in accordance with State and Federal rules.

1. Contractor shall keep copies of licenses, initial training course certificate, and most recent annual refresher training certificate at the jobsite at all times for all contractor personnel.
2. A licensed asbestos abatement supervisor (competent person) shall be present at the worksite at all times when work under this section is being conducted.

B. Medical Screening. All contractor personnel shall have a current medical examination in accordance with OSHA requirements. Copies of the Physician's Written Opinions shall be kept on site.

3.2 PERMISSIBLE EXPOSURE LIMITS

A. The OSHA permissible exposure limit (PEL) for worker exposure to airborne asbestos is 0.1 f/cc as an 8-hour time-weighted average (TWA).

B. The OSHA short term excursion limit for worker exposure to airborne asbestos is 1.0 f/cc for a 30 minute sample.

C. The permissible level of airborne fibers in areas adjacent to the work area is 0.01 f/cc as determined by PCM in general accordance with NIOSH Method 7400.

1. Work shall immediately cease in the work area containment when an airborne fiber concentrations exceed this level.
2. The source of outside contamination shall be determined, and corrective measures (e.g. wet cleaning, changes in work practices, negative pressure containment) shall be implemented to prevent recurrence.
3. The contractor shall be responsible for cleanup of contamination in adjacent areas caused by the asbestos abatement activities.

3.3 EXPOSURE ASSESSMENT AND MONITORING

A. The Contractor shall make an assessment of the airborne exposures. The assessment shall conform to OSHA requirements and may be based upon:

1. Initial monitoring of representative workers who the contractor believes are exposed to the greatest airborne concentrations of asbestos.
2. Past monitoring (within the past 12 months) or objective data for conditions closely resembling the processes, type of material, control methods, work practices and environmental conditions to be used for this project.
3. Review of the documentation may require approval from local regulators to be accepted.

B. The contractor shall perform daily personal monitoring in accordance with those requirements as established in OSHA or by the local governing authority / enforcement officer.

3.4 RESPIRATORY PROTECTION

A. Respiratory protection shall be worn by all persons potentially exposed to airborne asbestos fibers from the start of the abatement project until all areas have passed clearance air monitoring.

B. Contractor shall have a written respiratory protection program in accordance with OSHA 29 CFR 1910.134, including but not limited to, medical screening, semi-annual fit testing, training, cleaning and maintenance.

C. Respirators shall not be removed while in the work area.

D. Only NIOSH-approved respirators shall be used.

E. Additional respiratory protection such as organic vapor cartridges, may be needed when handling some solvents, coatings, or stripping products. Consult the MSDS, manufacturer, or industrial hygienist, and obtain the proper cartridges and usages as necessary.

3.5 HYGIENE PRACTICES

A. Eating, drinking, smoking, chewing gum or tobacco, and applying of cosmetics are not allowed in the work area.

B. All persons entering the work area are required to wear appropriate PPE, and follow the entry and exit procedures posted in the Personnel Decontamination Enclosure System.

C. PPE shall include, at a minimum:

1. Full body disposable suits, headgear (including respirators), and footwear.

2. Gloves.
3. Non-disposable footwear and clothing shall remain in the work area and shall be disposed of as contaminated waste when the job is completed.
4. Authorized visitors shall be provided with suitable PPE.

3.6 PROHIBITED ACTIVITIES

A. Dry removal or dry sweeping.

B. Use of compressed air for cleaning.

C. Use of high speed power tools not equipped with a HEPA-filtered local exhaust system.

3.7 WORK AREA ISOLATION AND PREPARATION

A. General Preparation. Contractor shall:

1. Post:

    a. OSHA asbestos warning signs at every entrance to the work area.
    b. Decontamination and work procedures in equipment rooms and clean rooms.
    c. USEPA NESHAP asbestos rules (40 CFR Part 61, subparts A & M) in the clean room.
    d. OSHA Asbestos Construction Standards (29 CFR 1926.1101) in the clean room.
    e. Entry and Exit Log
    f. List of telephone numbers in the clean room for:
        (1) local hospital and/or local emergency squad.
        (2) owner security office (if applicable).
        (3) owner representative reachable 24 hours per day.
        (4) contractor's headquarters.
        (5) architects or consultants directly involved in the project.

2. Secure the work area from entry by unauthorized persons using black polyethylene sheeting as a construction area barrier and post construction warning signs.
3. Separate work areas from occupied areas.
    a. Seal off all doorways and corridors which will not be used for passage during work.
    b. Install isolation barriers in all openings larger than 4' x 8', consisting of double-layer 6-mil poly to prevent access to the contained areas.
4. Have an approved fire extinguisher in the equipment room.
5. Install and maintain walk-off mats to the general work entrance.

B. Interior Preparation

1. Install negative air machine in the work area. The equipment shall exhaust through a HEPA filter to the outside of the building, or the exhaust will be double filtered. The equipment shall remain in operation twenty-four hours a day until decontamination of the work area and final

air sampling and analysis is completed. Seal openings around exhaust ducts. Exhaust from the negative air movement equipment shall not be allowed to be released within the buildings unless unfeasible as determined by the EC. All HEPA filtered air movement equipment shall be maintained according to this specification or regulations.

2. Coordinate with the Facility or Mechanical Contractor for the shut down and isolation of heating, ventilating, air conditioning (HVAC) systems which are within the work area(s).
3. Seal off all windows, corridors, doorways, bathrooms, closets, skylights, ducts, grilles, diffusers, and other penetrations or openings with 6-mil poly and tape.
4. Protect and cover floors, in those areas in which no abatement is to be performed with 6-mil poly with seams staggered and taped, and extending 12" up walls. Maintain for the duration of the project.
5. Protect and cover the walls in the work area.
6. Protect and cover non-movable fixed objects from which no abatement will be conducted (e.g. fixed cabinets, shelves, etc.).
7. Asbestos materials shall not be disturbed during the Preparation phase.
8. Maintain emergency and fire exits.
9. In all areas for abatement install a three chamber Worker Decontamination Enclosure System, consisting of clean room, shower room (both hot and cold water), and equipment room separated by air locks, all with curtained doorways, of sufficient size to serve the size of the crew.

    a. Where an adjacent decon unit is not feasible (i.e., for multiple tented glovebag operations), the AC shall (only with an approved variance from the EC):

        (1) set up the decon unit within the work area barriers
        (2) establish a negative pressure of at least 0.02" water column (wc) between the equipment room and adjacent spaces, including the clean room
        (3) provide at least 4 air changes per hour within the decontamination unit

10. Once operational, the system shall be inspected daily. Damages and defects will be repaired immediately upon discovery.

B. Exterior Preparation (for areas that interface with interior work)

1. 6 mil poly sheeting shall be placed over the ground, foundation, or other surfaces below the abatement area.
2. Unauthorized entry shall be prevented by using appropriate barriers, such as warning tape, fencing, or other suitable barriers.
3. Nearby air intakes, grilles, and other openings into the building interior shall be sealed off with 6 mil poly and tape.

3.8 ABATEMENT PROCEDURES

A. Removal:

1. Asbestos materials shall be wetted and kept wet during removal.
2. ACM waste shall be bagged or containerized as it is removed.
3. Work areas shall be kept wet until visible material is cleaned up.

4. Asbestos waste shall be removed from the work area daily.

   a. The waste shall be placed and sealed in a properly labeled 6-mil poly bag.

   b. The bag shall be cleaned and placed in a second properly labeled 6-mil poly bag. This bag shall be sealed by securing with duct tape, folding over taped area and goose necking with duct tape.

3.9 CLEANING AND DECONTAMINATION

A. All visible accumulations of ACM, debris, tools, and unnecessary equipment shall be removed from the work area.

C. First clean:

1. Wet clean all surfaces and remove excess water.

2. Remove outer layer of poly and dispose as ACM waste (splash guards and poly protecting the underlying surfaces).

3. Critical barriers on windows, doors, penetrations, and other openings shall remain in place and negative air system shall remain in continuous operation until final clearance tests have passed.

C. Visual inspection: EC and contractor jointly inspect the work area for visible residue and excess water and, if observed, repeat the clean/ wait cycle until residues are not detected and work area is dry.

D. Remove all tools, cleaning materials, remaining wastes from the work area.

E. Apply lock-down encapsulants where specified in the Documents.

F. Notify EC that work area is ready for final clearance testing.

3.10 FINAL CLEARANCE

A. Final clearance testing shall be performed after the final cleaning and visual inspection has been completed and where no visible water or condensation remains.

B. All work areas shall be tested and analyzed by either PCM or Transmission Electron Microscopy (TEM) methodologies.

C. If final clearance test(s) fail, the AC shall be responsible for repeating the cleaning sequence as necessary until final clearance tests are successful, at no additional cost to the owner. The AC shall also be responsible for paying for the additional time and expenses incurred by the EC for conducting the repeat clearance sampling, analysis and project oversight.

D. Upon completion of a successful visual inspection and test, a “punch list” walkthrough shall be conducted for each area that contained special wastes, non-hazardous special waste or hazardous waste within five working days of completion of the work by the Contractor. The Contractor, Environmental Consultant and the Owner will participate in the walkthrough. All punch list items shall be completed within five working days of walkthrough. The items will include all deficiencies found in the inspections of the AC’s work which is to be corrected. When the deficiencies have been removed, the AC shall request a re-inspection by the EC.

3.11 SPECIAL PROCEDURES

A. **Glovebag Procedure**: Glovebags may be used to remove small sections of ACM pipe insulation encountered.

1. Typical Preparation/notification requirements apply.
2. Glovebag removal will require a single layer, 6 mil poly tent containment with negative pressure air filtration.
3. Monitoring will be performed by the EC.
4. Glovebag construction shall be 6 mil poly with seamless bottom, suitable for the intended use (straight runs, fittings, elbows, vertical pipes, etc.) without modification.
5. At least two licensed workers shall perform glovebag operations.
6. Workers shall wear full body PPE and at least a ½ mask respirator equipped with a P-100 cartridge. Note here, too, that OSHA still requires an exposure assessment and respirators that are appropriate for the expected airborne fiber concentrations.
7. Prior to use, all loose or damaged material adjacent to the operation shall be wrapped in two layers of 6 mil poly or otherwise be rendered intact.
8. Work Practices shall include:
    a. Install to completely cover the circumference of pipe or other structure. Pipe insulation diameter shall not exceed ½ the bag working length above the glove sleeves.
    b. Smoke test for leaks and seal any leaks prior to use.
    c. Single use and not moved.
    d. Wet removal methods on the materials to be removed and wet cleaning to remove all visible ACM from the pipe or structure surfaces.
    e. Not to be used on surfaces greater than 150^0F.
    f. Spray down the interior surfaces of the bag, substrate, and removed ACM.
    g. Wet down remaining ACM surfaces or seal with encapsulant.
    h. Seal off the lower portion of the bag containing the ACM waste by twisting several times and sealing with tape.
    i. Collapse glovebag with a HEPA vacuum.
    j. Place the detached glovebag directly into a 6 mil poly waste disposal bag and gooseneck-seal it in the waste disposal bag for disposal.
    k. Dispose in accordance with this specification.

3.12 WASTE DISPOSAL AND EQUIPMENT LOAD-OUT

A. Preparing equipment for load-out

1. Remove gross debris form equipment and wet wipe all surfaces.
2. Seal openings to prevent escape of internal contamination; or open equipment, remove filters, and make equipment interiors accessible for cleaning and decontamination.

B. Packaging asbestos wastes:

1. All asbestos-containing wastes, including removed ACM and debris, containment poly, critical barrier materials, suits, respirator cartridges, vacuums and negative air machine HEPA filters, water filters, and other asbestos-containing items shall be properly packaged in 6 mil poly for disposal.
2. Use double 6 mil poly bags with “gooseneck” seal, or other impermeable containers.
3. Wrap large or irregular items in 2 layers of 6 mil poly sheeting and seal with tape.
4. Sharp, jagged, or other items that may puncture poly shall be packaged in rigid impermeable containers such as drums or boxes or wrapped in burlap or other protective covering before sealing in double bags or double layers of 6 mil poly.
5. Label containers:
    a. OSHA warning label.
    b. DOT performance-oriented hazardous material label.
    c. Name and address of generator and abatement location.

C. Removing items from the work area:

1. Packaged asbestos wastes, non-porous debris (such as doors, hardware, and other items that can be decontaminated), and equipment shall be wet cleaned, moved into the equipment decontamination enclosure system, cleaned a second time, and moved into the holding area.
2. Containers and equipment shall be removed from the holding area by workers in clean PPE and respirators who enter from the uncontaminated side (outside). The equipment decontamination enclosure system shall not be used to enter or exit the work area.

D. Storage of packaged asbestos wastes shall be in a completely enclosed dumpster or other suitable container that can be secured. The secured area shall be kept locked at all times to prevent unauthorized access.

E. Shipment of items from the project.

1. Decontaminated tools and equipment may be shipped by normal carrier to warehouse, another jobsite, or other destination.
2. For asbestos wastes:
    a. Line shipping container with 6 mil poly prior to loading packaged asbestos wastes.
    b. Post NESHAP placards during loading.
    c. Persons performing loading operations shall wear PPE including respirators.
    d. Containers and packages shall be tightly packed together to prevent shifting during transport. Large components or heavy items shall be secured to prevent shifting and shall not be stacked on top of bags.
    e. Execute the NESHAP-required Waste Shipment Record (WSR) to be signed by the generator, transporter, and landfill. All WSRs shall be returned to the EC within 30 days of shipment.

F. Disposal of packaged asbestos wastes.

1. Only landfills approved and permitted by the State of Iowa for accepting asbestos wastes may be used for disposal.

3.13 DEMOBILIZATION

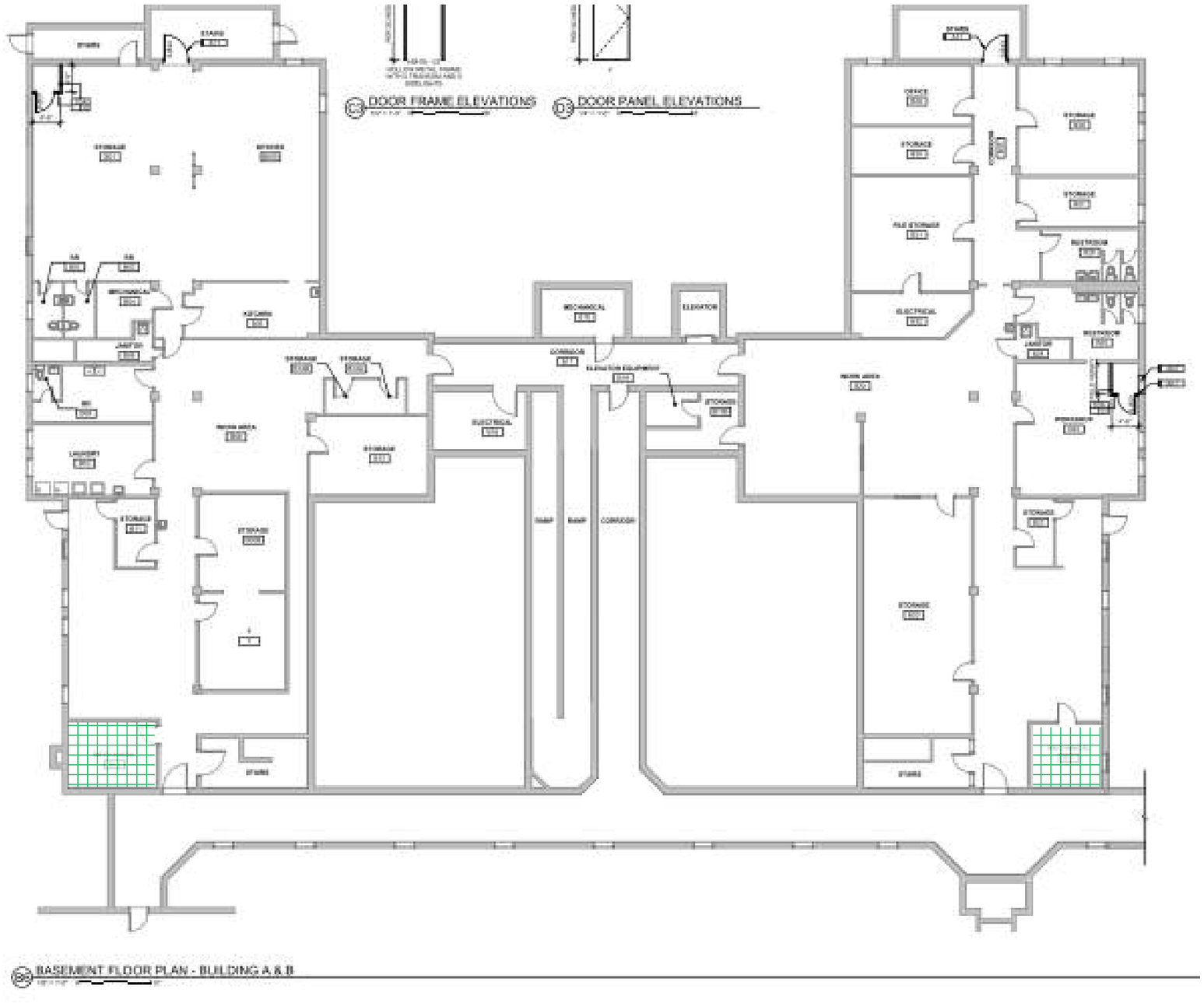
A. EC shall visually inspect the work area for evidence of visible debris prior to releasing the area for tear-down. Detection of contamination will require additional cleaning and re-testing of the work area.

B. Remove critical barriers and seals.

****

END OF SECTION 02081

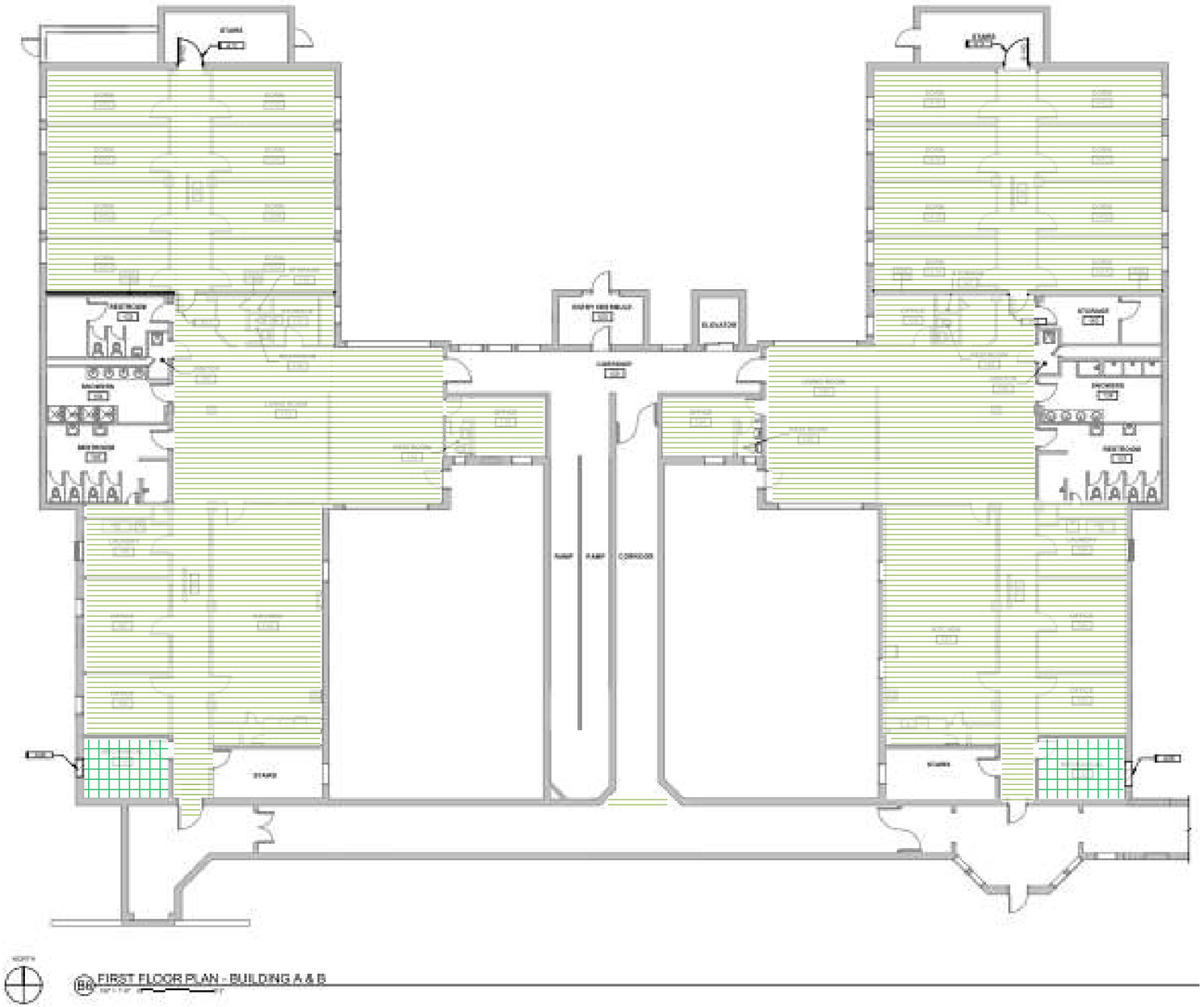
Drawings



White Sealant on Fiberglass Piping

Note: **Only Water Circulation Lines throughout the basement have asbestos containing mudded mechanical fittings. If these become part of the Scope of Work in the Renovation, they will need to be abated.**

Project No. 204BS09286	Date: May 5, 2026	ATLAS 11117 Mockingbird Drive Omaha, NE 68137 PH. (402) 697-9747	**Asbestos Containing Material Locations** Linden Court A/B Building 1251 334th Street Woodward, IA 50276
Project Manager: Phillip Thomas			
Name: Basement Level			



Acoustical Ceiling Texture

White Sealant of Fiberglass Piping

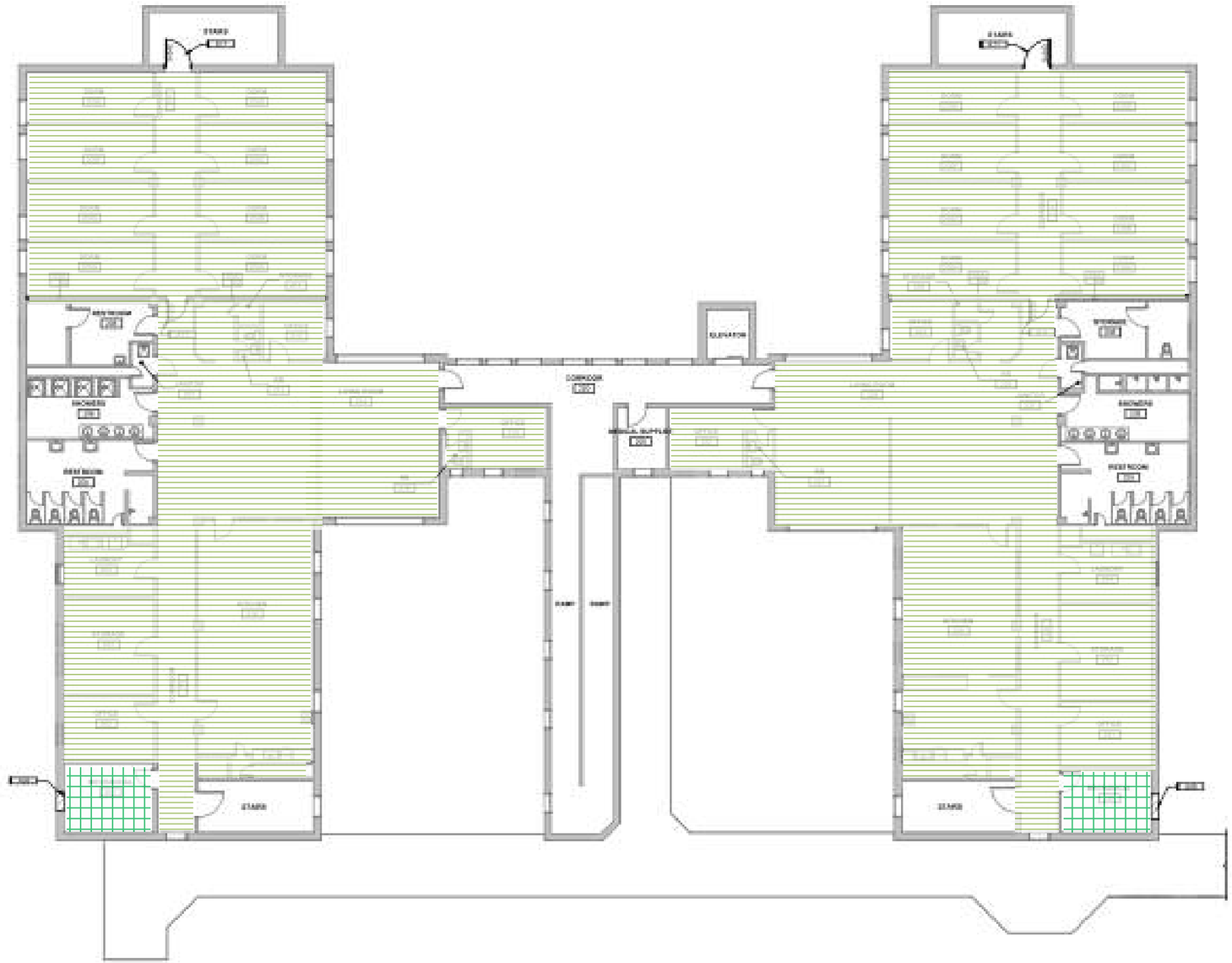
FIRST FLOOR PLAN - BUILDING A & B

Project No. 204BS09286	Date: May 5, 2026
Project Manager: Phillip Thomas	
Name: 1st Floor	

ATLAS
11117 Mockingbird Drive
Omaha, NE 68137
PH. (402) 697-9747

Asbestos Containing Material Locations

Linden Court A/B Building
1251 334th Street
Woodward, IA 50276



Acoustical Ceiling Texture

White Sealant of Fiberglass Piping

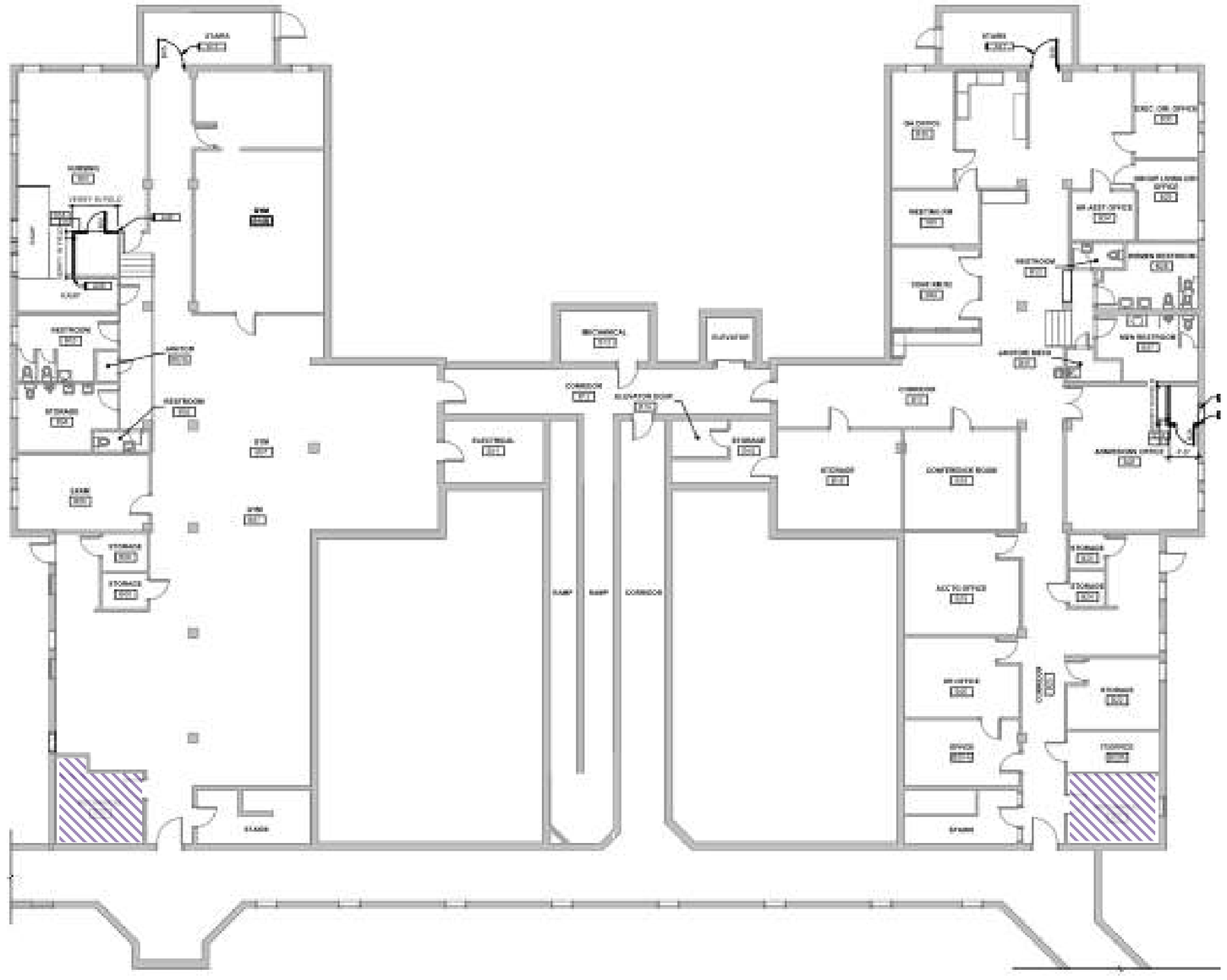
SECOND FLOOR PLAN - BUILDING A & B

Project No. 204BS09286	Date: May 5, 2026, 2026
Project Manager: Phillip Thomas	
Name: 2nd Floor	

ATLAS
11117 Mockingbird Drive
Omaha, NE 68137
PH. (402) 697-9747

Asbestos Containing Material Locations

Linden Court A/B Building
1251 334th Street
Woodward, IA 50276



White Sealant on Fiberglass Piping

Note: **Only Water Circulation Lines throughout the basement have asbestos containing mudded mechanical fittings. If these become part of the Scope of Work in the Renovation, they will need to be abated.**

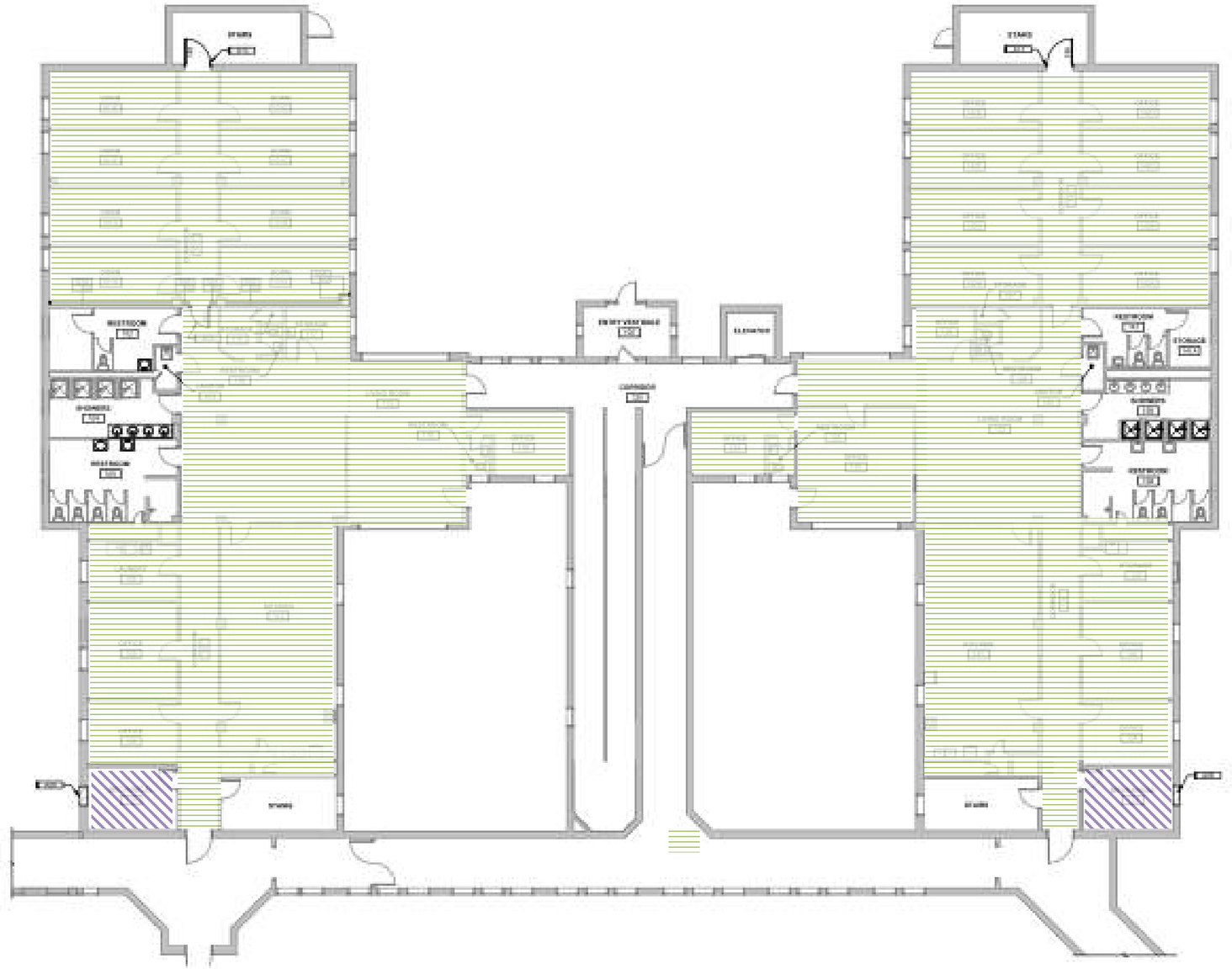
BASEMENT FLOOR PLAN - BUILDING C & D

Project No. 204BS09286	Date: May 5, 2026
Project Manager: Phillip Thomas	
Name: Basement Level	

ATLAS
11117 Mockingbird Drive
Omaha, NE 68137
PH. (402) 697-9747

Asbestos Containing Material Locations

Linden Court C/D Building
1251 334th Street
Woodward, IA 50276



White Sealant on Fiberglass Piping

Acoustical Ceiling Texture

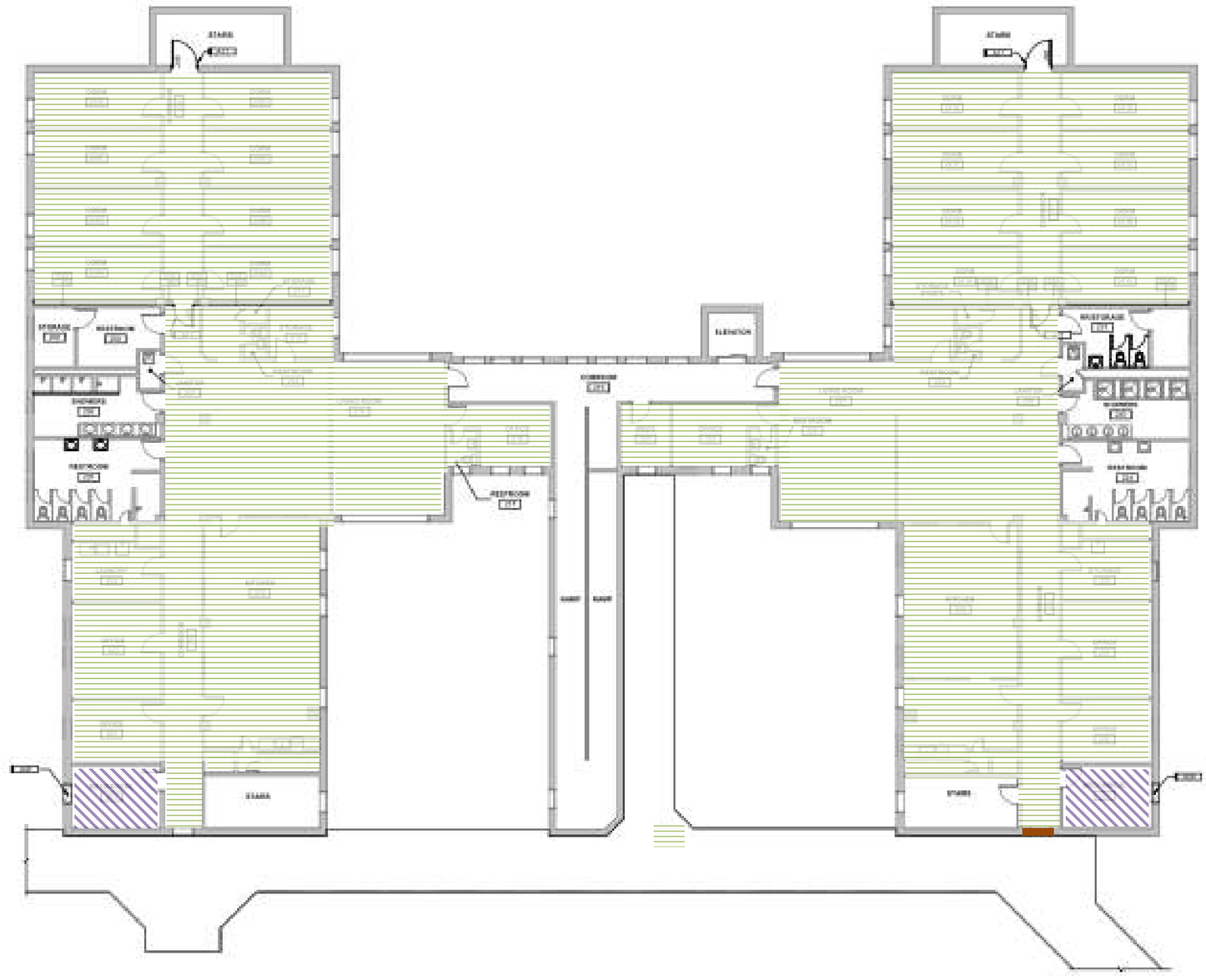
FIRST FLOOR PLAN - BUILDING C & D

Project No. 204BS09286	Date: May 5, 2026
Project Manager: Phillip Thomas	
Name: 1st Floor	

ATLAS
11117 Mockingbird Drive
Omaha, NE 68137
PH. (402) 697-9747

Asbestos Containing Material Locations

Linden Court C/D Building
1251 334th Street
Woodward, IA 50276



White Sealant on Fiberglass Piping

Window Glazing

Acoustical Ceiling Texture

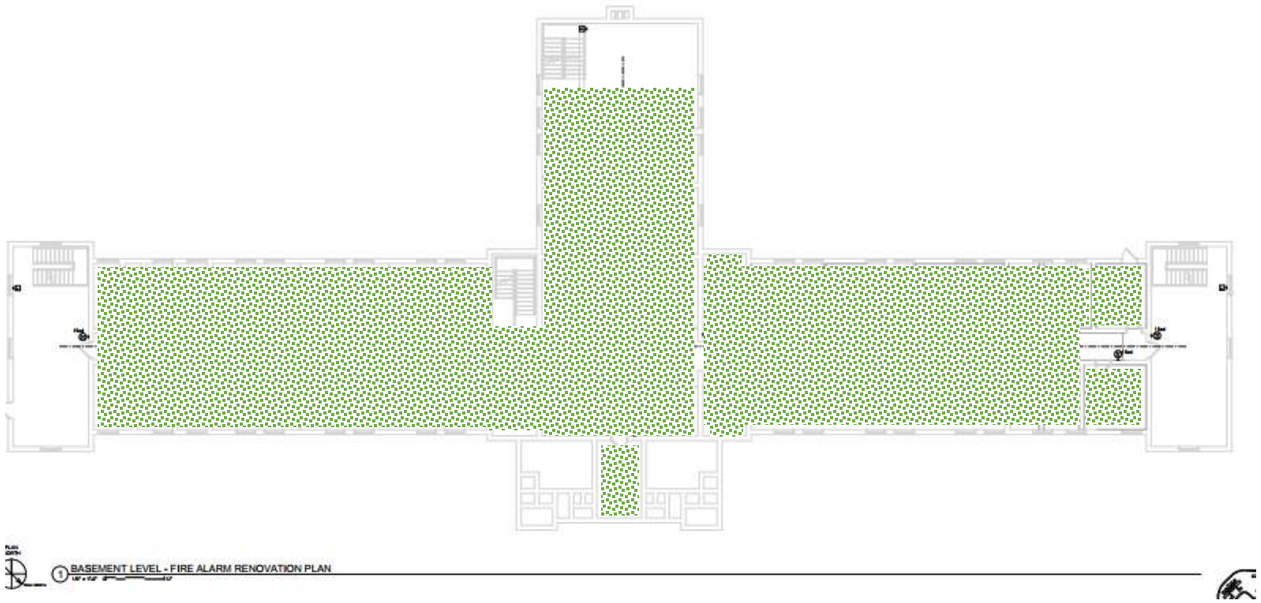
SECOND FLOOR PLAN - BUILDING C & D

Project No. 204BS09286	Date: May 5, 2026
Project Manager: Phillip Thomas	
Name: 2nd Floor	

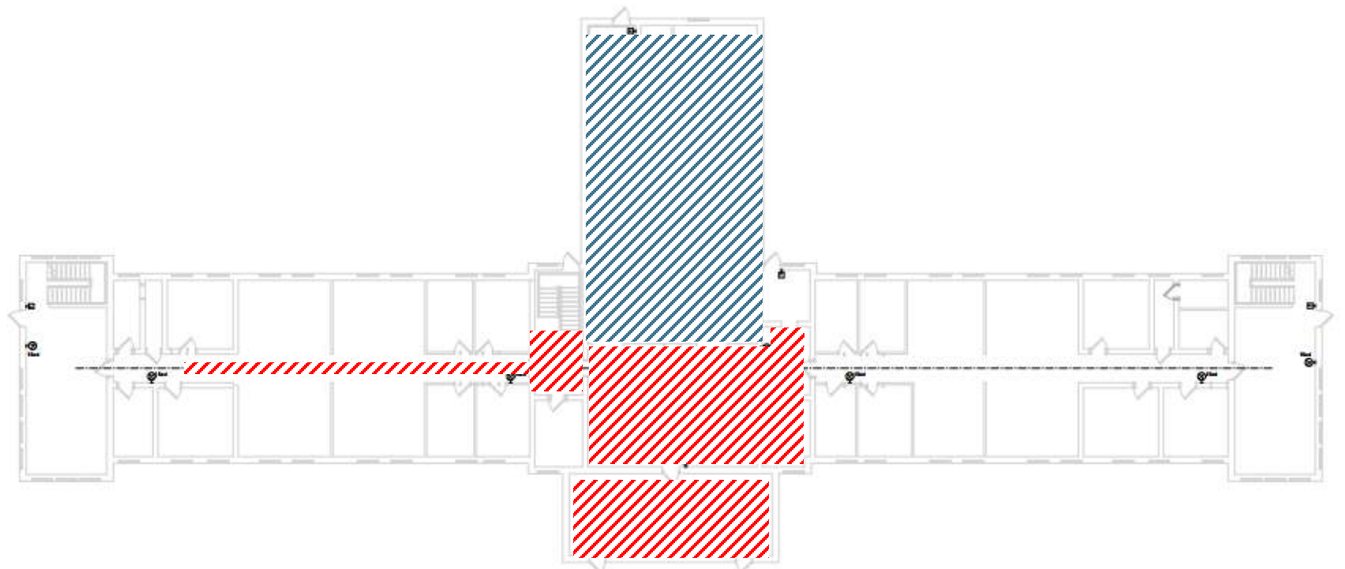
ATLAS
11117 Mockingbird Drive
Omaha, NE 68137
PH. (402) 697-9747

Asbestos Containing Material Locations

Linden Court C/D Building
1251 334th Street
Woodward, IA 50276



1 BASEMENT LEVEL - FIRE ALARM RENOVATION PLAN



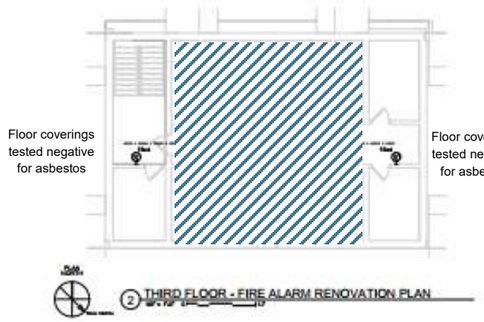
1 FIRST FLOOR - FIRE ALARM RENOVATION PLAN

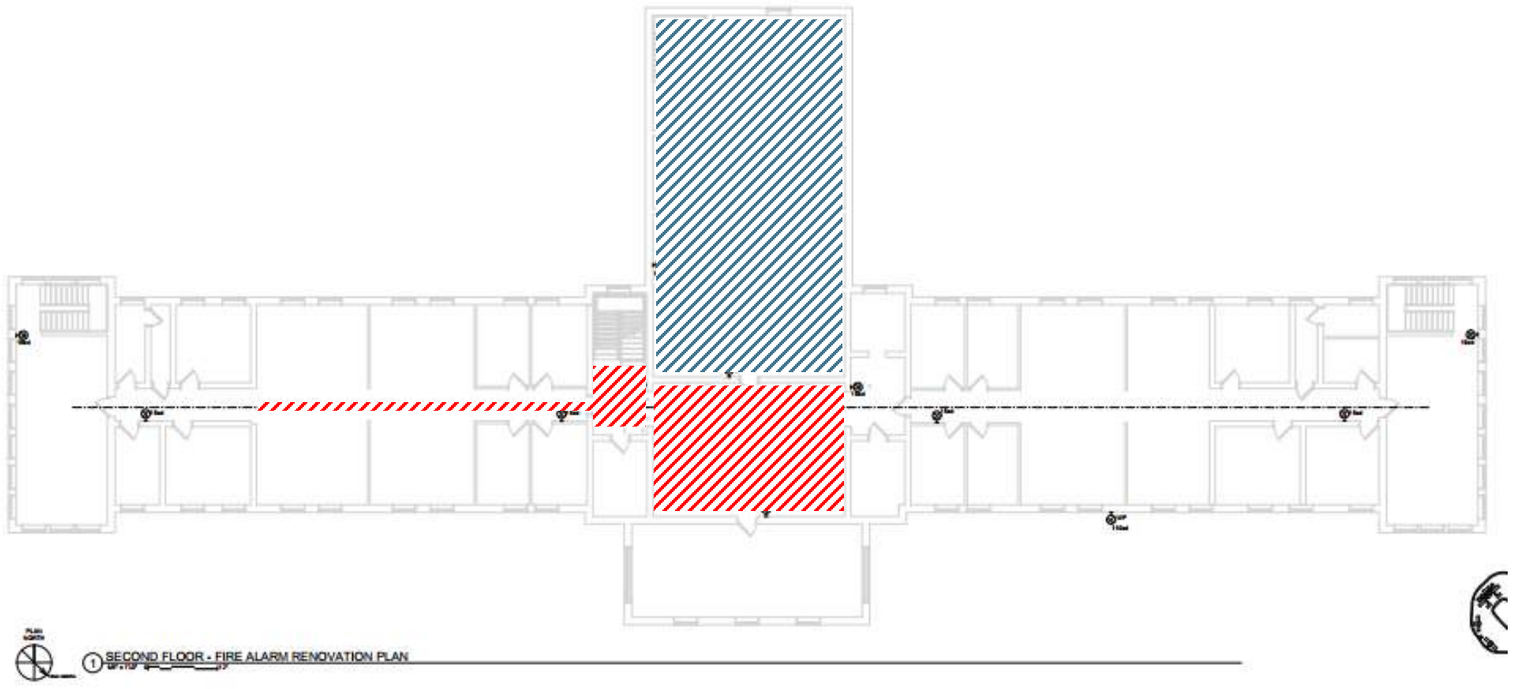
= 9” x 9” Floor Tile (brown) and Black Mastic – abate 5’ each side of center line down corridor

= No Floor Coverings

= Thermal Systems Insulation on Piping and Debris on Floor Throughout

Project No. 204BS09428	Date: April 16, 2026	ATLAS 11117 Mockingbird Drive Omaha, NE 68137 PH. (402) 697-9747	**Potential Penetration Areas** Oak Hall 1251 334th Street Woodward, IA 50276
Project Manager: Phillip Thomas			
Name: Oak Hall Basement and 1st Floor			

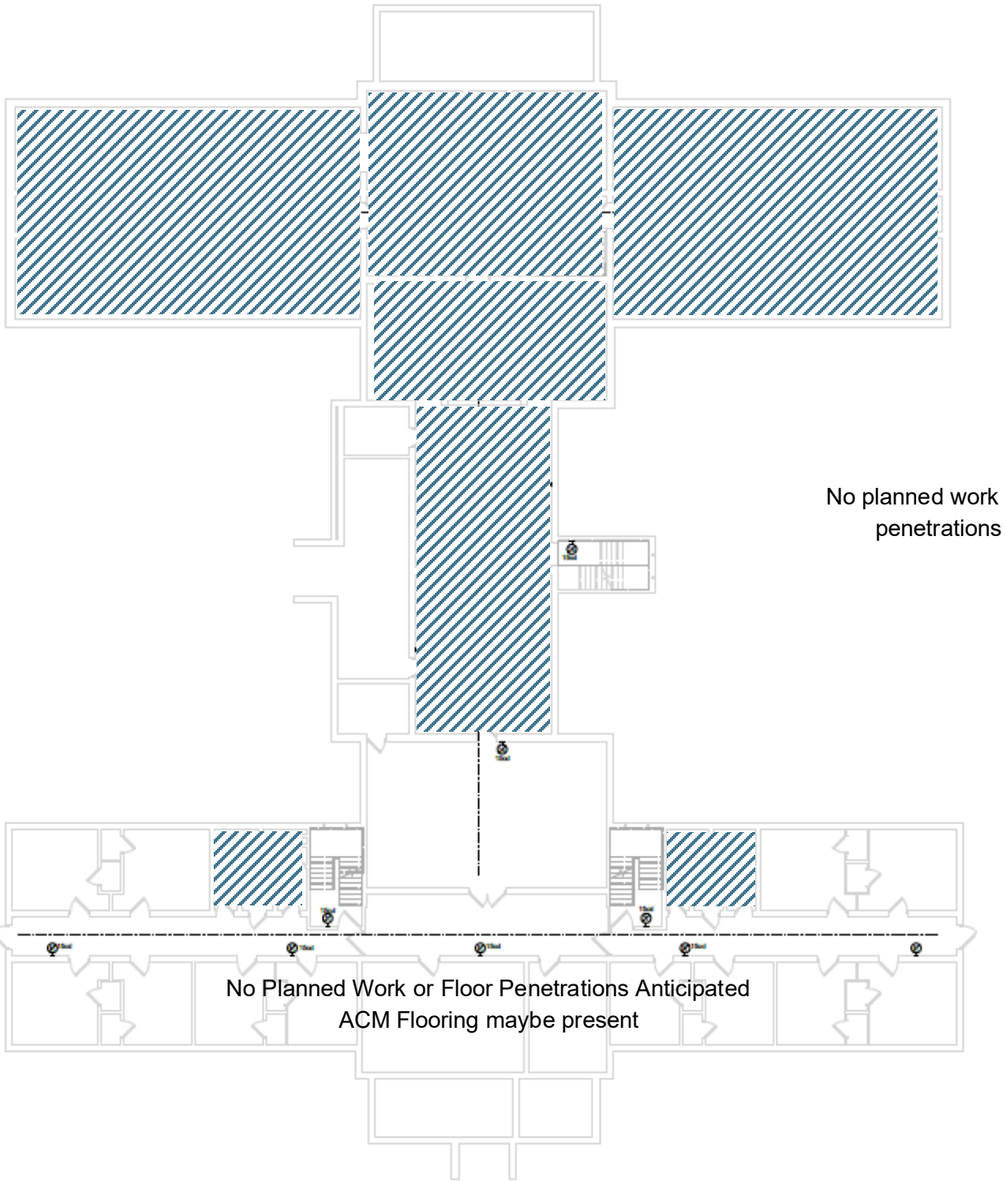




= = No Floor Coverings

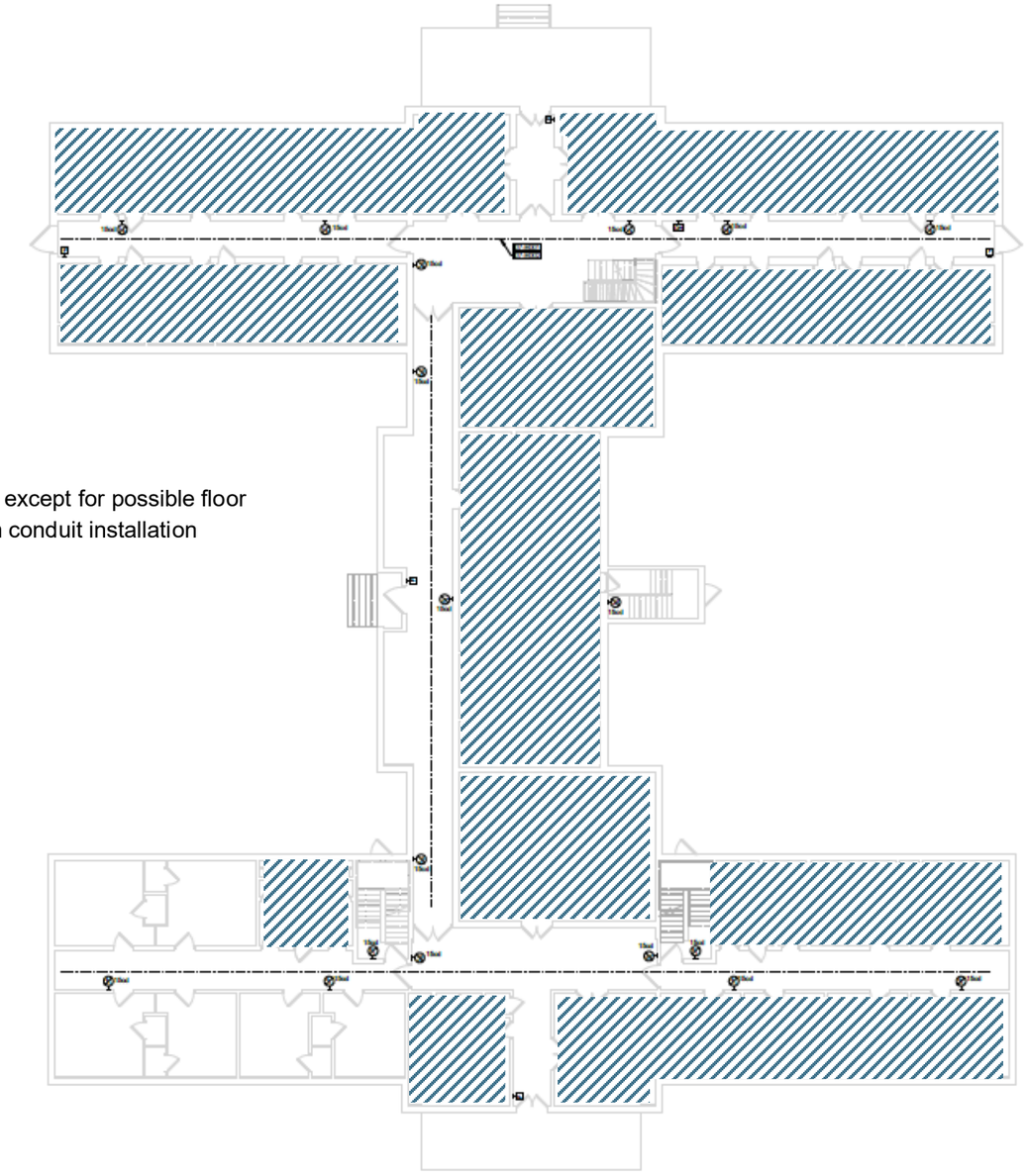
= = 9” x 9” Floor Tile (brown) and Black Mastic – abate 5’ each side of center line down corridor

Project No. 204BS09428	Date: April 16, 2026	ATLAS 11117 Mockingbird Drive Omaha, NE 68137 PH. (402) 697-9747	**Potential Penetration Areas** Oak Hall 1251 334th Street Woodward, IA 50276
Project Manager: Phillip Thomas			
Name: Oak Hall 2nd and 3rd Floor			



No Planned Work or Floor Penetrations Anticipated
ACM Flooring maybe present

1 BASEMENT LEVEL - FIRE ALARM RENOVATION PLAN

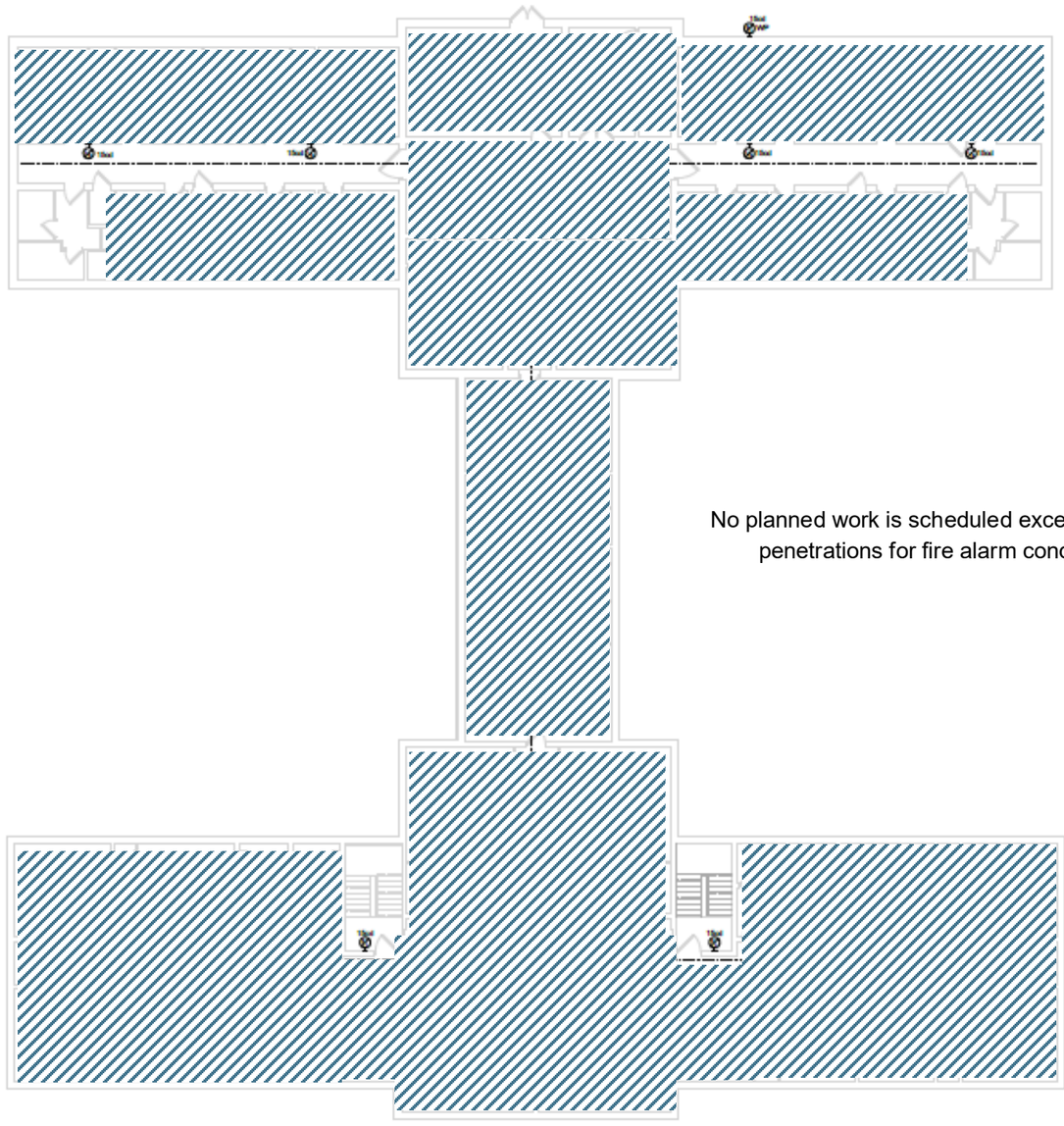


No planned work is scheduled except for possible floor penetrations for fire alarm conduit installation

1 FIRST FLOOR - FIRE ALARM RENOVATION PLAN

= No Floor Coverings

Project No. 204BS09428	Date: March 5, 2025	ATLAS 11117 Mockingbird Drive Omaha, NE 68137 PH. (402) 697-9747	**Potential Penetration Areas**
Project Manager: Phillip Thomas			Employee Home 1251 334th Street Woodward, IA 50276
Name: Basement and 1st Floors			

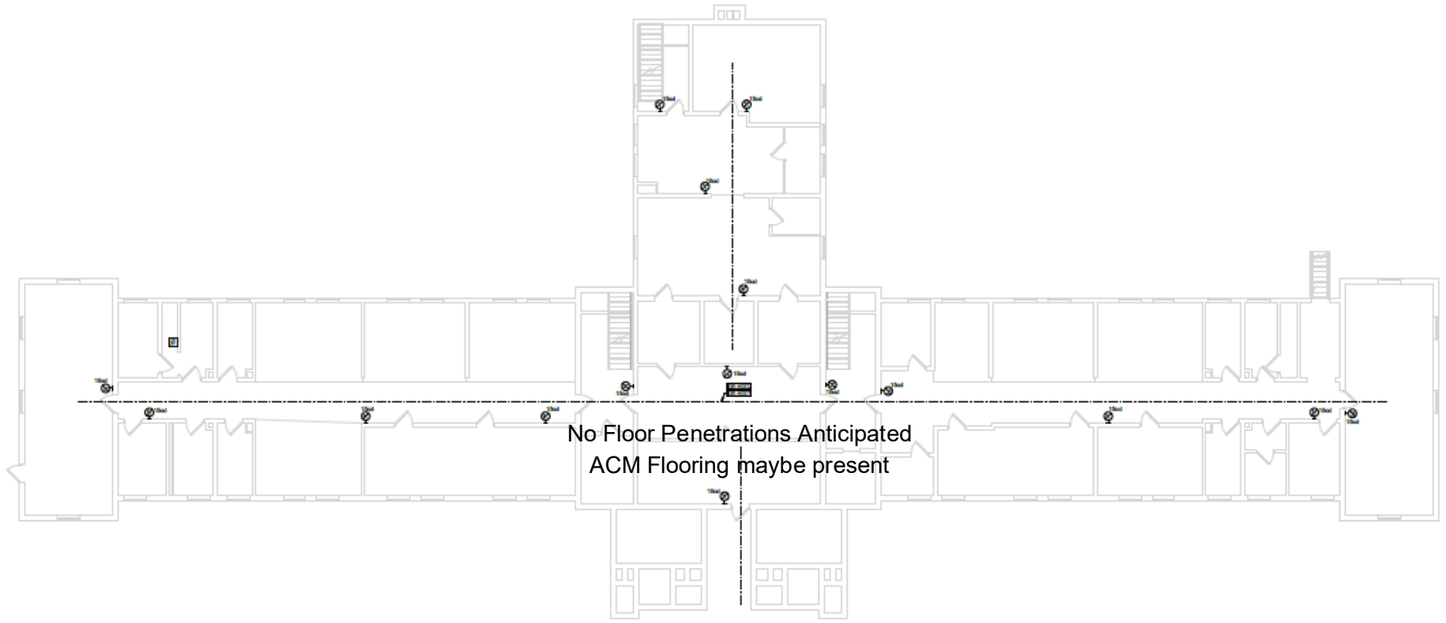


No planned work is scheduled except for possible floor penetrations for fire alarm conduit installation

1 SECOND FLOOR - FIRE ALARM RENOVATION PLAN

= No Floor Coverings

Project No. 204BS09428	Date: March 5, 2026	ATLAS 11117 Mockingbird Drive Omaha, NE 68137 PH. (402) 697-9747	**Potential Penetration Areas**
Project Manager: Phillip Thomas			Employee Home 1251 334th Street Woodward, IA 50276
Name: 2nd Floor			



A5 BASEMENT LEVEL - FIRE ALARM RENOVATION PLAN

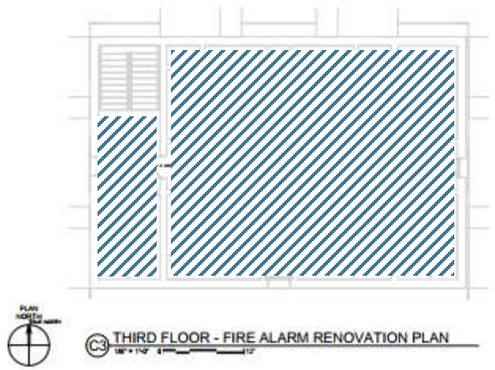
No planned work is scheduled except for possible floor penetrations for fire alarm conduit installation



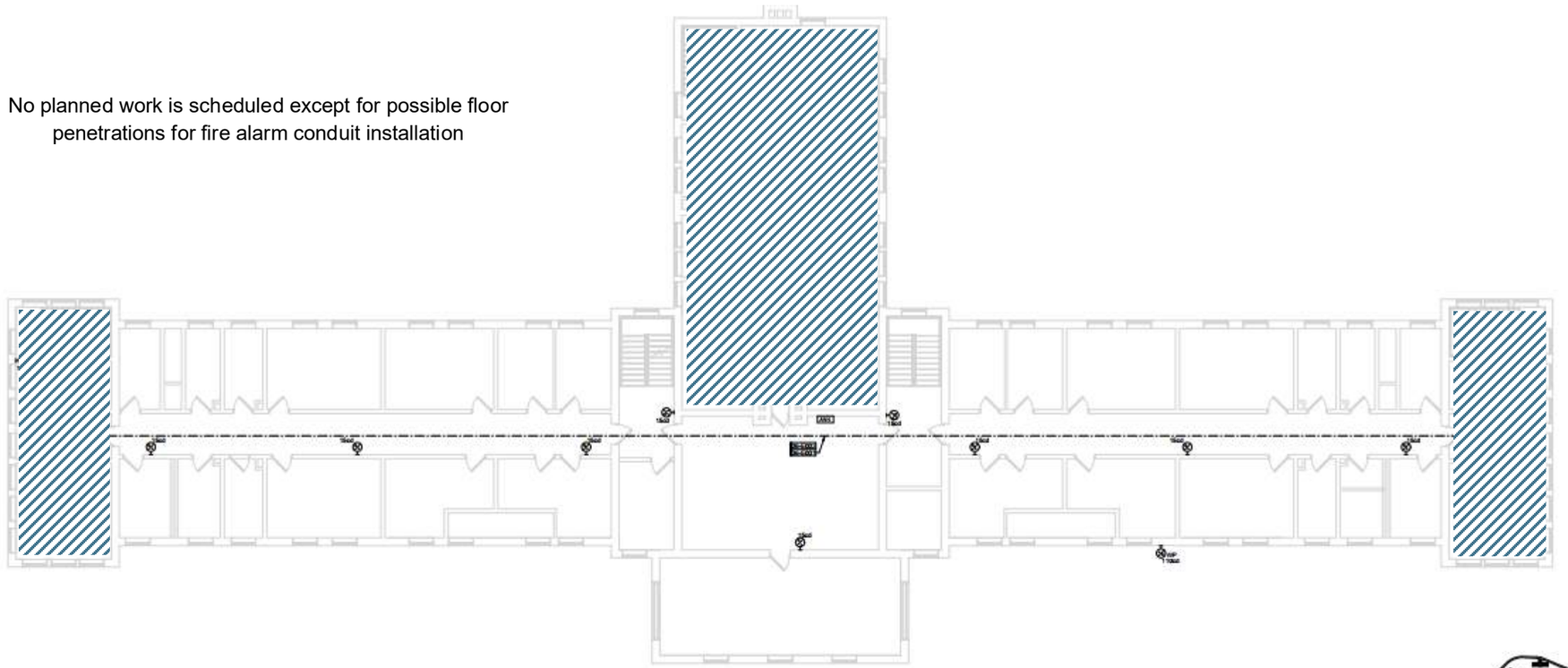
= No Floor Coverings

A5 FIRST FLOOR - FIRE ALARM RENOVATION PLAN

Project No. 204BS09428	Date: March 5, 2026	ATLAS 11117 Mockingbird Drive Omaha, NE 68137 PH. (402) 697-9747	**Potential Penetration Areas** Hemlock 1251 334th Street Woodward, IA 50276
Project Manager: Phillip Thomas			
Name: Basement and 1st Floors			

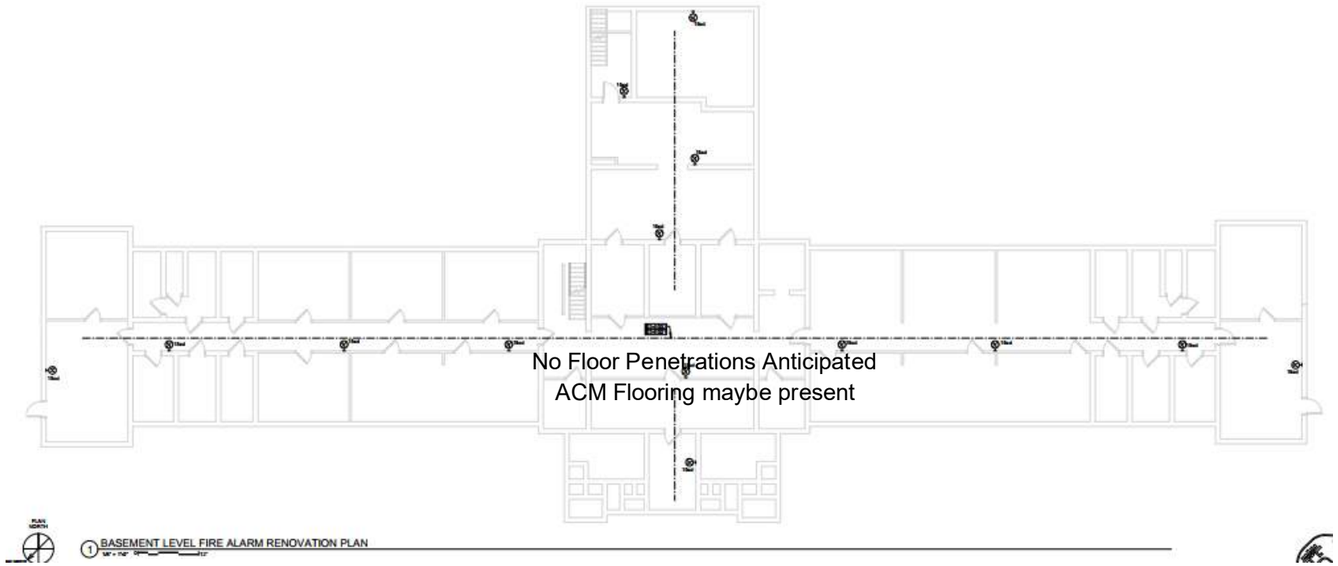


No planned work is scheduled except for possible floor penetrations for fire alarm conduit installation



= No Floor Coverings

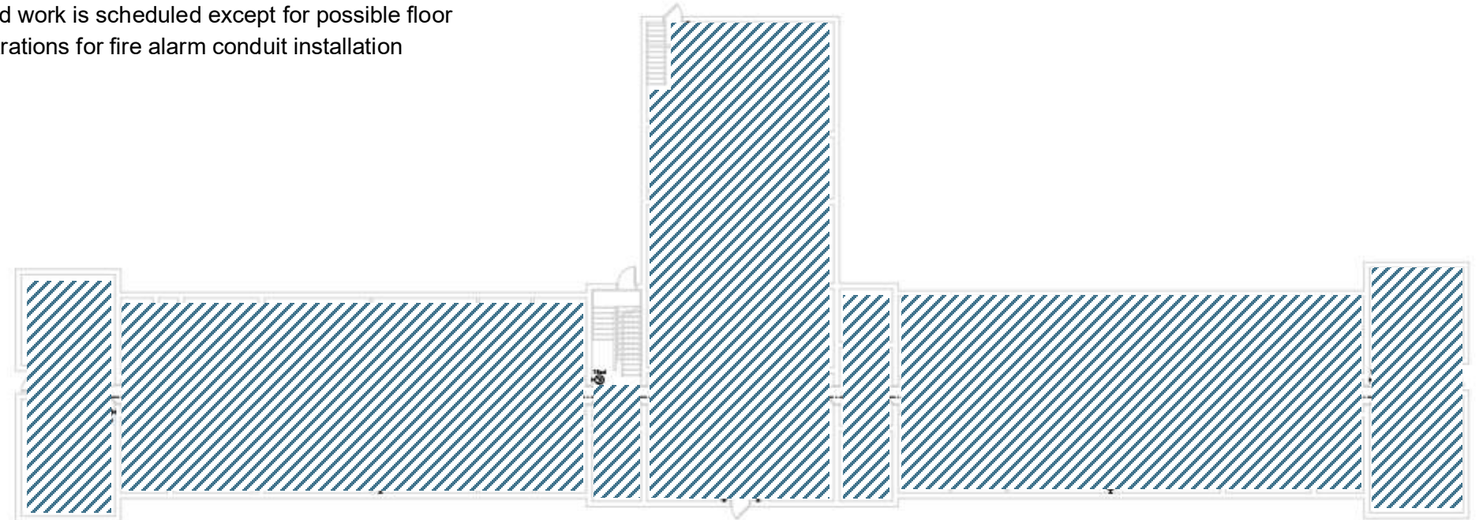
Project No. 204BS09428	Date: March 5, 2026	ATLAS 11117 Mockingbird Drive Omaha, NE 68137 PH. (402) 697-9747	**Potential Penetration Areas** Hemlock 1251 334th Street Woodward, IA 50276
Project Manager: Phillip Thomas			
Name: 2nd and 3rd Floors			



No Floor Penetrations Anticipated
ACM Flooring maybe present

1 BASEMENT LEVEL FIRE ALARM RENOVATION PLAN

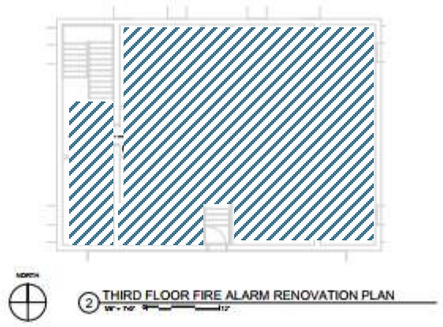
No planned work is scheduled except for possible floor penetrations for fire alarm conduit installation



= No Floor Coverings

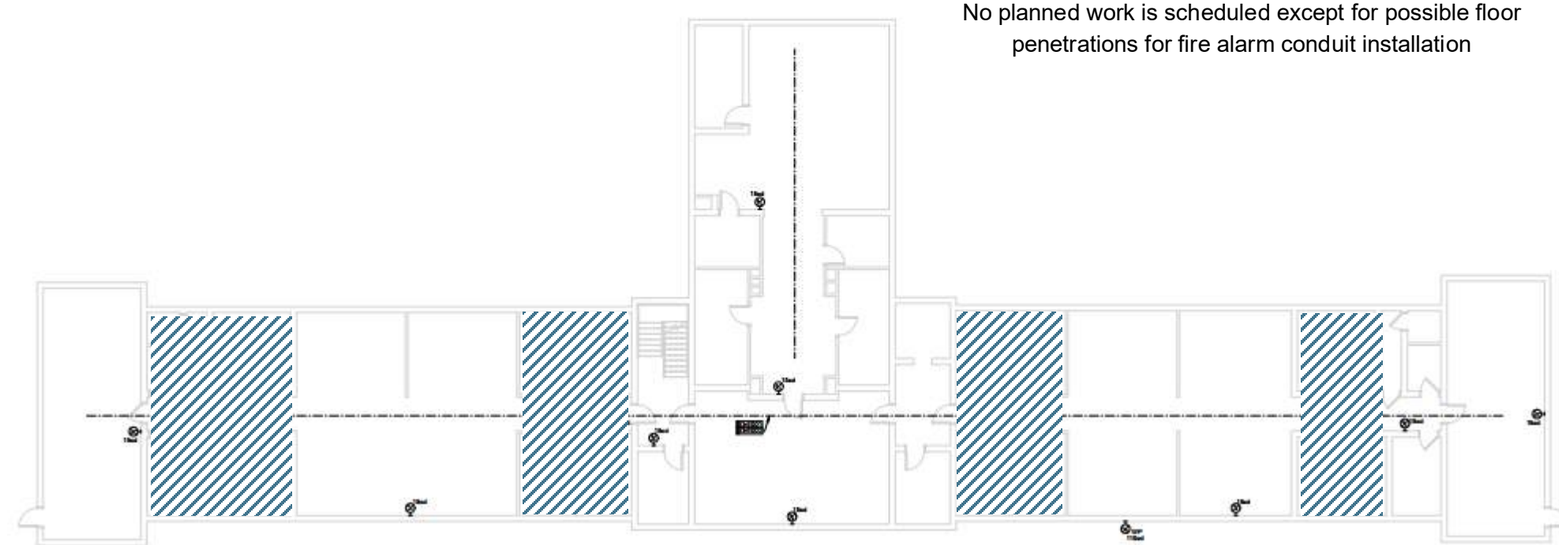
1 FIRST FLOOR FIRE ALARM RENOVATION PLAN

Project No. 204BS09428	Date: March 5, 2026	ATLAS 11117 Mockingbird Drive Omaha, NE 68137 PH. (402) 697-9747	**Potential Penetration Areas** Larches 1251 334th Street Woodward, IA 50276
Project Manager: Phillip Thomas			
Name: Basement and 1st Floors			



② THIRD FLOOR FIRE ALARM RENOVATION PLAN

No planned work is scheduled except for possible floor penetrations for fire alarm conduit installation

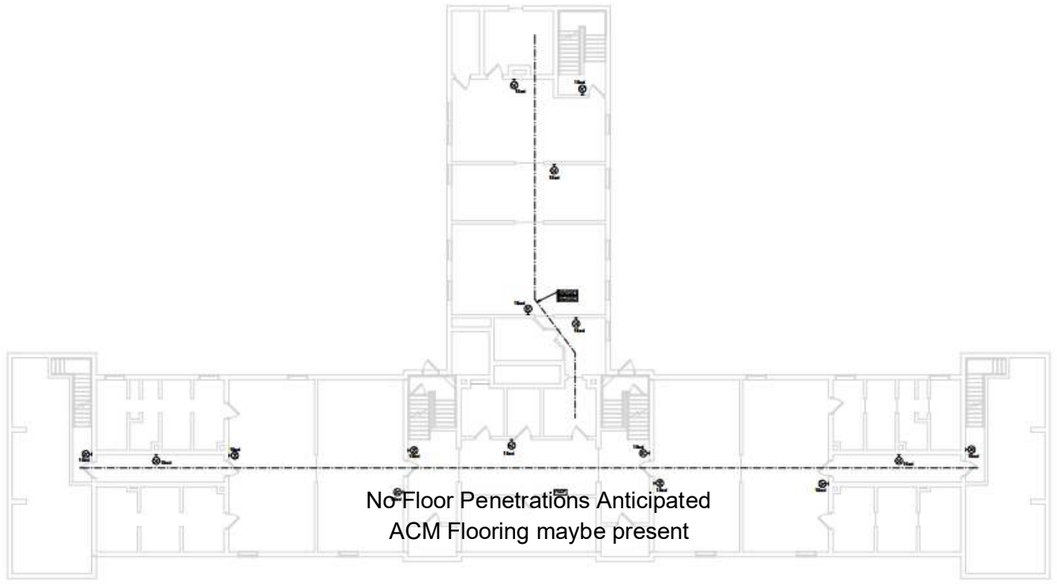


① SECOND FLOOR FIRE ALARM RENOVATION PLAN



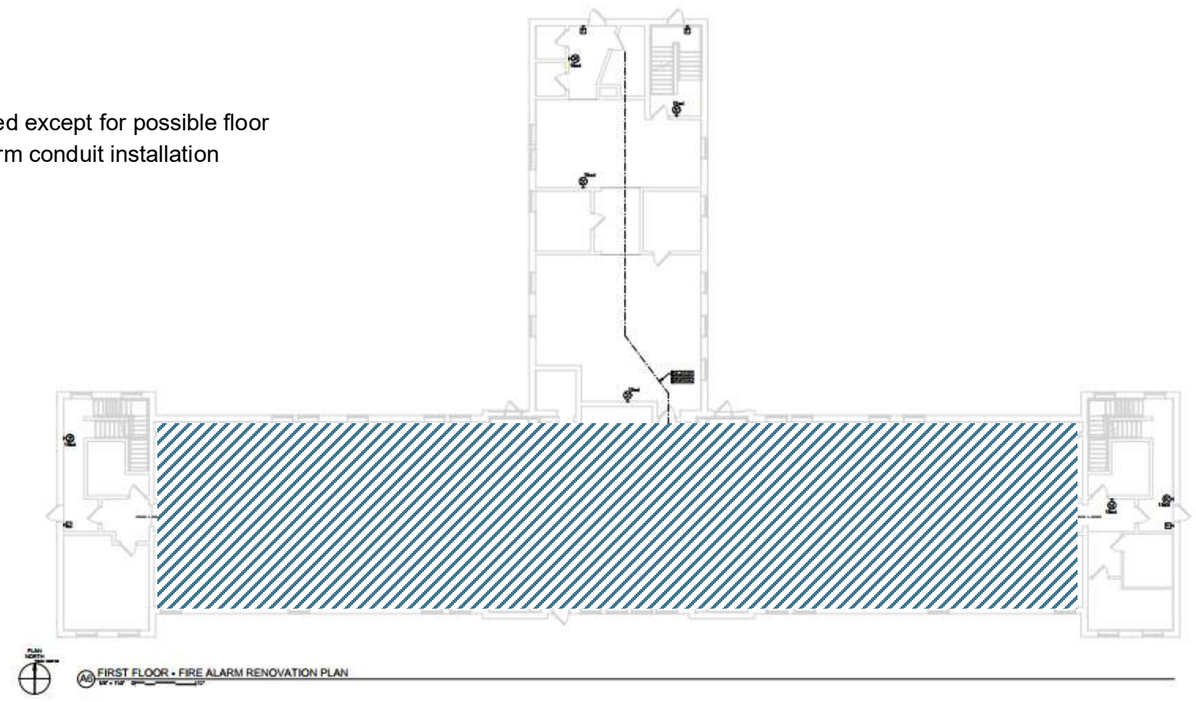
= No Floor Coverings

Project No. 204BS09428	Date: March 5, 2026	ATLAS 11117 Mockingbird Drive Omaha, NE 68137 PH. (402) 697-9747	**Potential Penetration Areas**
Project Manager: Phillip Thomas			Larches 1251 334th Street Woodward, IA 50276
Name: 2nd and 3rd Floors			



A0 BASEMENT LEVEL - FIRE ALARM RENOVATION PLAN

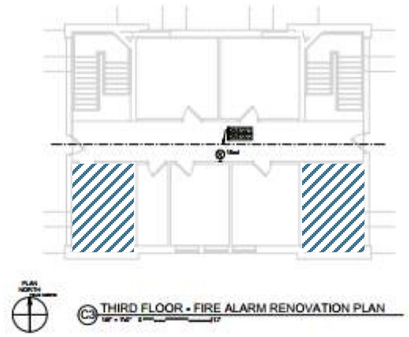
No planned work is scheduled except for possible floor penetrations for fire alarm conduit installation

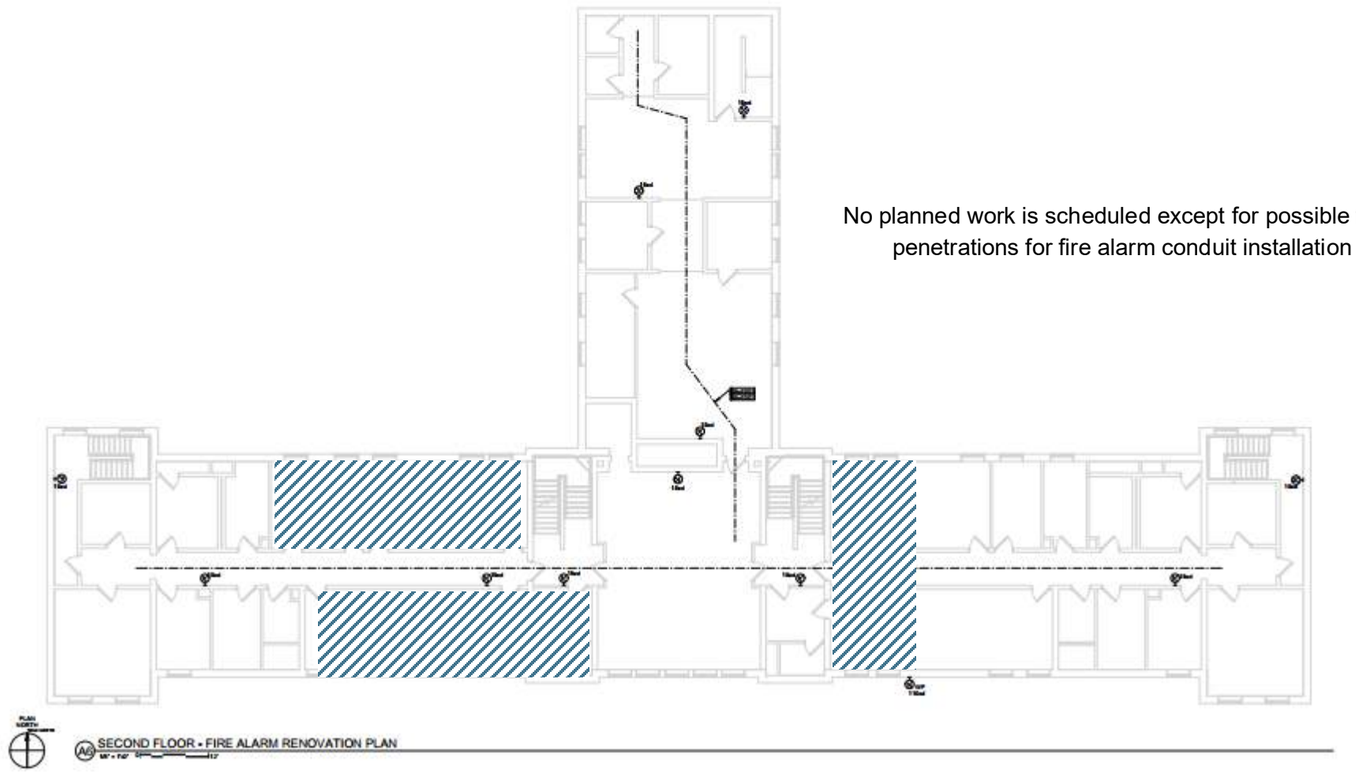


A0 FIRST FLOOR - FIRE ALARM RENOVATION PLAN

= No Floor Coverings

Project No. 204BS09428	Date: March 5, 2026	ATLAS 11117 Mockingbird Drive Omaha, NE 68137 PH. (402) 697-9747	**Potential Penetration Areas** Maple Lodge 1251 334th Street Woodward, IA 50276
Project Manager: Phillip Thomas			
Name: Maple Lodge Basement and 1st Floor			

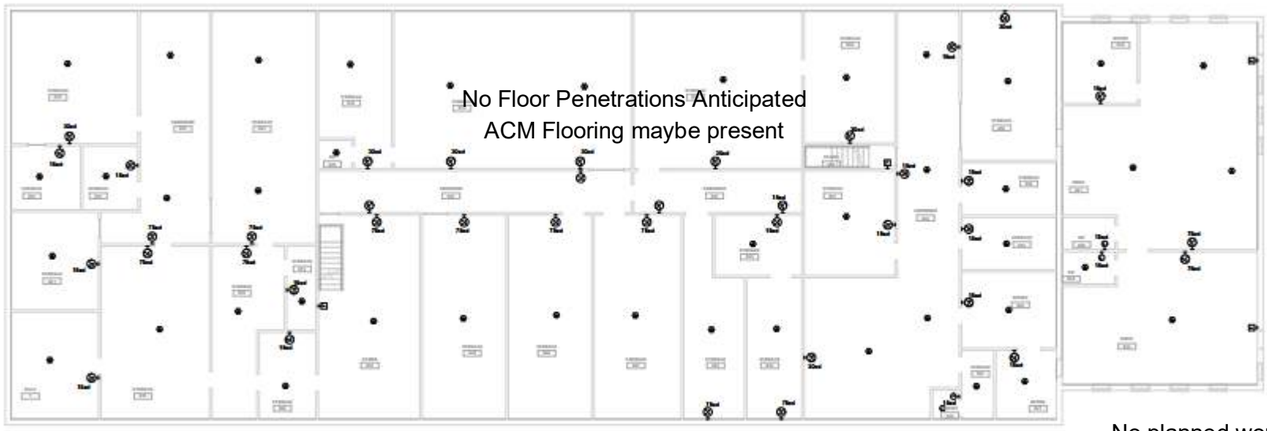




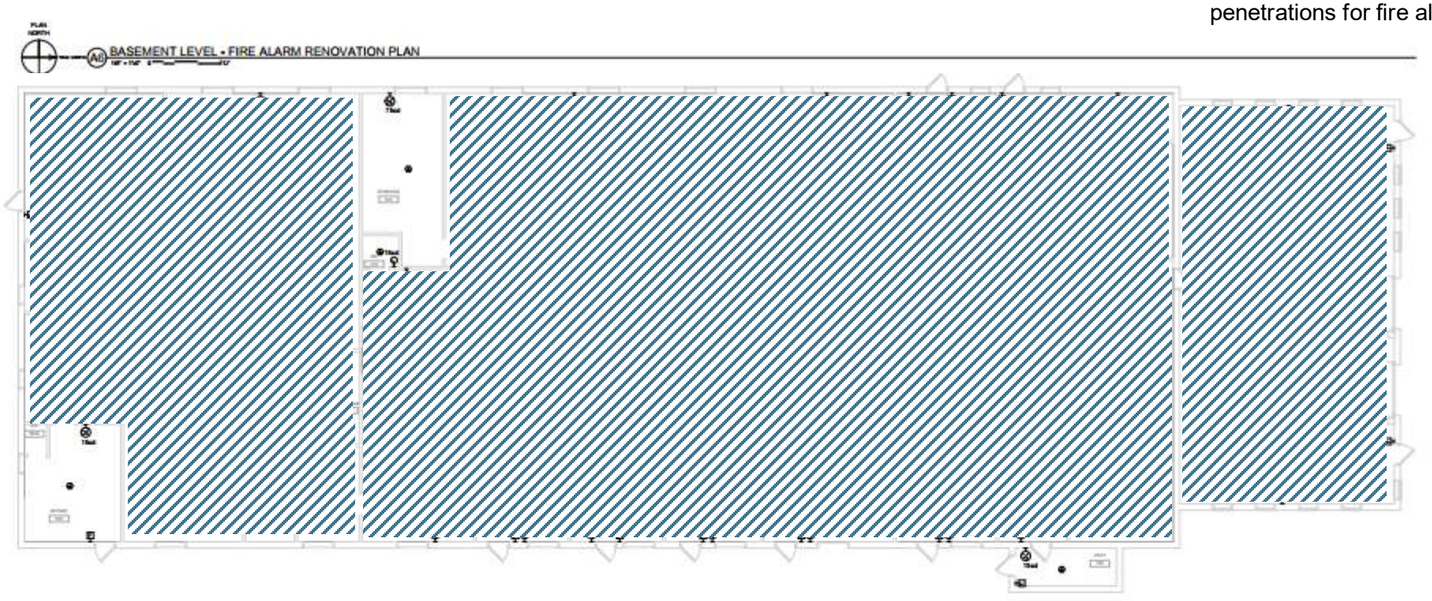
No planned work is scheduled except for possible floor penetrations for fire alarm conduit installation

= No Floor Coverings

Project No. 204BS09428	Date: March 5, 2026	ATLAS 11117 Mockingbird Drive Omaha, NE 68137 PH. (402) 697-9747	**Potential Penetration Areas**
Project Manager: Phillip Thomas			Maple Lodge 1251 334th Street Woodward, IA 50276
Name: Maple 2nd and 3rd Floor			



No planned work is scheduled except for possible floor penetrations for fire alarm conduit installation





= No Floor Coverings

Project No. 204BS09428	Date: March 5, 2025	ATLAS 11117 Mockingbird Drive Omaha, NE 68137 PH. (402) 697-9747	**Potential Penetration Areas**
Project Manager: Phillip Thomas			Supply Depot 1251 334th Street Woodward, IA 50276
Name: Supply Depot Basement and 1st Floor			

No planned work is scheduled except for possible floor penetrations for fire alarm conduit installation



PLAN NORTH

A6 SECOND FLOOR - FIRE ALARM RENOVATION PLAN

= No Floor Coverings

Project No. 204BS09428	Date: March 5, 2026	ATLAS 11117 Mockingbird Drive Omaha, NE 68137 PH. (402) 697-9747	**Potential Penetration Areas**
Project Manager: Phillip Thomas			Supply Depot 1251 334th Street Woodward, IA 50276
Name: Supply Depot 2nd Floor			

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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. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section. See Division 01 for submittal procedures, quality requirements, alterations of work, and closeout requirements.

B. Division 01 - Contract Summary: Description of items to be salvaged or removed for re-use by Contractor.

C. Division 01 - Product Requirements.

D. Division 01 - Execution: Project conditions; protection of existing construction to remain.

1.3 DEFINITIONS

A. Demolition: Dismantle, raze, destroy or wreck any building or structure or any part thereof.

B. Remove: Detach or dismantle items from existing construction and dispose of them off site, unless items are indicated to be salvaged or reinstalled.

C. Remove and Salvage: Detach or dismantle items from existing construction in a manner to prevent damage. Clean, package, label and deliver salvaged items to Owner in ready-for-reuse condition.

D. Remove and Reinstall: Detach or dismantle items from existing construction in a manner to prevent damage. Clean and prepare for reuse and reinstall where indicated.

E. Existing to Remain: Designation for existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

1.4 REFERENCE STANDARDS

A. 29 CFR 1926 - Safety and Health Regulations for Construction; Current Edition.

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

1.5 SUBMITTALS

A. See Section 01 3300 - Submittal Procedures for submittal procedures.

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

C. The Contractor shall submit utility service termination certificates, copies of demolition notices, and permits to the Architect/Engineer prior to removal.

D. 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.

E. The Contractor shall submit a 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.

PART 3 EXECUTION

2.1 DEMOLITION

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

2.2 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with requirements in Division 01.

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

1. Stop work immediately if adjacent structures appear to be in danger.

E. 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.

F. Hazardous Materials:

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

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.

H. Accurately record locations of capped utilities and subsurface obstructions on the Contractor's record drawing set.

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

1. Remove items indicated on drawings.

C. 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. Verify that abandoned services serve only abandoned facilities before removal.
4. 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.

D. 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. Remove materials not to be reused on site; do not burn or bury.

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

D. 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 interior concrete flatwork, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:

1. Slabs-on-grade.

1.2 REFERENCE STANDARDS

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

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

C. ACI 301 - Specifications for Structural Concrete; 2016.

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

E. ACI 305R - Guide to Hot Weather Concreting; 2010.

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

G. ACI 308R - Guide to External Curing of Concrete; 2016.

H. ACI 347R - Guide to Formwork for Concrete; 2014, with Errata (2017).

I. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2018a.

J. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2020.

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

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

M. ASTM C109/C109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50 mm] Cube Specimens); 2021.

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

O. ASTM C150/C150M - Standard Specification for Portland Cement; 2021.

P. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2016.

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

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

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

T. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2019.

U. ASTM C31/C31M - Standard Practice for Making and Curing Concrete Test Specimens in the Field; 2021a.

V. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2018.

W. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2018.

X. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2019.

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

Z. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2019.

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

BB. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2020.

CC. ASTM D1709 - Standard Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method; 2024.

DD. ASTM E1155/E1155M - Standard Test Method for Determining FF Floor Flatness and FL Floor Levelness Numbers; 2023.

EE. AWS D1.4/D1.4M - Structural Welding Code - Steel Reinforcing Bars; 2018, with Amendment.

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. 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. Curing compounds.
6. Floor and slab treatments.
7. Adhesives.
8. Joint-filler strips.
9. Repair materials.

B. 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.

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

D. 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.

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, 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 to the plane of exposed concrete surface.
2. Furnish ties that, when removed, will leave holes no larger than 1 inch 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, deformed.

B. 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 F or 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 F or 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 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. 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 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. when dry.

C. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 1, Class B, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.

1. Manufacturers: Subject to compliance with requirements, provide the following:

a. Anti-Hydro International, Inc.; AH Clear Cure WB.

b. BASF Construction Chemicals - Master Builders Solutions; MasterKure CC 160 WB.

c. ChemMasters; Safe-Cure & Seal 309.

d. Cresset Chemical Company; Crete-Trete 309-VOC Cure & Seal.

e. Dayton Superior Corporation; Cure & Seal 309 J18.

f. Euclid Chemical Company (The); Aqua Cure VOX.

g. Kaufman Products, Inc.; Krystal 15 Emulsion.

h. Laticrete International, Inc.; L&M Dress & Seal WB.

i. Meadows, W. R., Inc.; Vocomp-20.

j. Metalcrete Industries; Metcure.

k. Nox-Crete Products Group; Cure & Seal 150E.

l. Vexcon Chemicals, Inc.; Starseal 309.

m. Or Engineer Pre-Approved Equivalent.

2.7 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: Flexible, closed-cell polyethylene with tear off strip for sealant installation.

B. 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.

2.8 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch 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 or coarse sand as recommended by underlayment manufacturer.

4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C109/C109M.

2.9 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.

2.10 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4000 psi 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.

2.11 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.12 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, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, 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 for smooth-formed finished surfaces.
2. Class B, 1/4 inch 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 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 achievedat 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 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.

3.5 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete; match existing jointing.

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 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 or more than 1 inch 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.

3.6 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 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 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 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.

3.7 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.

3.8 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/E1155M, 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/E1155M 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/E1155M 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.

3.9 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 high unless otherwise indicated; and extend base not less than 6 inch in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated.
3. Minimum Compressive Strength: 4000 psi at 28 days.
4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18 inch 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.

3.10 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 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 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, 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 Compound: Apply uniformly in 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. Maintain continuity of coating and repair damage during curing period.

a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

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.

3.11 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.

3.12 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 in any dimension to solid concrete. Limit cut depth to 3/4 inch. 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 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 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 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 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 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.

3.13 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. 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 and below and when 80 deg F 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.
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 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/E1155M within 72 hours of finishing.

END OF SECTION

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SECTION 04 2000
UNIT MASONRY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Concrete Masonry Units.

B. Clay Facing Brick.

C. Mortar and Grout.

D. Reinforcement and Anchorage.

E. Flashings.

F. Accessories.

1.2 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

B. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications; 2020a.

C. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2020.

D. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2019.

E. ASTM A951/A951M - Standard Specification for Steel Wire for Masonry Joint Reinforcement; 2022.

F. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2018a.

G. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2017.

H. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2018.

I. ASTM C150/C150M - Standard Specification for Portland Cement; 2021.

J. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale); 2019.

K. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019a.

L. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2016.

M. ASTM D226/D226M - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2017.

N. ASTM D4637/D4637M - Standard Specification for EPDM Sheet Used in Single-Ply Roof Membrane; 2015 (Reapproved 2021).

O. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing; 2017.

P. BIA Technical Notes No. 13 - Ceramic Glazed Brick Exterior Walls; 2017.

Q. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.

1.3 SUBMITTALS

A. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, masonry accessories, anchors, and flashings.

1.4 QUALITY ASSURANCE

A. Comply with the requirements of the Brick Institute of America Technical Notes. This specification and the drawings are intended to reflect the general provisions of the BIA technical notes. Any discrepancies between these specifications, the details and/or any provisions of the BIA Technical Notes shall not relieve the contractor from his responsibility to comply with the most stringent requirements of the contract documents.

B. Mock-up: Install masonry infill in one location where directed by Owner/Architect for review and approval of quality. Work may remain in place if approved.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

PART 2 PRODUCTS

2.1 CONCRETE MASONRY UNITS

A. Concrete Block: Comply with referenced standards and as follows:

1. Size: Standard units with nominal face dimensions of 16 x 8 inches and nominal depth of 8 inches.

2. Non-Loadbearing Units: ASTM C129.

a. Hollow block, as indicated.

2.2 BRICK UNITS

A. Clay Facing Brick: Provided by Owner from existing stock.

2.3 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I; color as required to produce approved color sample.

B. Mortar Aggregate: ASTM C144.

C. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979.

1. Color(s): Match mortar on existing adjacent wall.

D. Water: Clean and potable.

E. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C494/C494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

F. Moisture-Resistant Admixture: Water repellent compound designed to reduce capillarity.

1. Manufacturer:

a. BASF; MasterPel 210D: {HL#1101432}

b. Euclid Chemical Co.; Blocktite Mortar Admixture: www.euclidchemical.com

c. Krete Industries, Inc.; Krete Gard Mortar Mix: www.krete.com

d. Architect pre-approved equivalent.

2.4 REINFORCEMENT AND ANCHORAGE

A. Manufacturers of Joint Reinforcement and Anchors:

1. Blok-Lok Limited: www.blok-lok.com/#sle.
2. Hohmann & Barnard, Inc; X-Seal Anchor: www.h-b.com/#sle.
3. WIRE-BOND; www.wirebond.com/#sle.
4. Architect pre-approved equivalent.

B. Reinforcing Steel: ASTM A615/A615M, Grade 60 - 60,000 psi, deformed billet bars; uncoated.

C. Joint Reinforcement: Use ladder type joint reinforcement where vertical reinforcement is involved and truss type elsewhere, unless otherwise indicated.

D. Single Wythe Joint Reinforcement: ASTM A951/A951M.

1. Type: Truss or ladder.
2. Material: ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to ASTM A153/A153M Class B.
3. Size: 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not less than 5/8 inch of mortar coverage on each exposure.

E. Adjustable Multiple Wythe Joint Reinforcement: ASTM A951/A951M.

1. Type: Truss, with adjustable ties or tabs spaced at 16 in on center.
2. Material: ASTM A1064/A1064M steel wire, hot dip galvanized after fabrication to ASTM A153/A153M Class B.
3. Size: 0.1875 inch side rods with 0.1483 inch cross rods and adjustable components of 0.1875 inchwire, width of components as required to provide not less than 5/8 inch of mortar coverage from each masonry face.
4. Vertical adjustment: Not more than 1 1/4 inches.

F. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A153/A153M Class B.

1. Anchor plates: Not less than 0.075 inch thick, designed for fastening to structural backup through sheathing by two fasteners; provide design with legs that penetrate sheathing and insulation to provide positive anchorage.
2. Wire ties: Manufacturer's standard shape, 0.1875 inch thick.
3. Vertical adjustment: Not less than 3-1/2 inches.

2.5 FLASHINGS

A. Metal Flashing Materials: Copper, as specified in Section 07 6200.

B. Copper/Polymer Fabric Flashing: 3 oz/sq ft copper sheet laminated between two sheets of polymer or fiberglass fabric.

1. Manufacturer:

a. Advanced Building Products, Inc.; Copper Sealtite 2000: www.advancedbuildingproducts.com/#sle.

b. Architect pre-approved equivalent.

C. Membrane Non-Asphaltic Flashing Materials:

1. Composite Polymer Flashings - Self-Adhering: Composite polyethylene; 40 mil thick with pressure-sensitive adhesive and release paper.

D. EPDM Flashing: ASTM D4637, Type I, 0.040 inch thick.

E. Factory-Fabricated Flashing Corners and Ends: Stainless steel.

1. Manufacturers:

a. Hohmann & Barnard, Inc: www.h-b.com/#sle.

b. York Manufacturing, Inc: www.yorkmfg.com/#sle.

c. Architect pre-approved equivalent.

F. Termination Bars: Stainless steel; compatible with membrane and adhesives.

G. Drip Edge: Stainless steel; angled drip with hemmed edge; compatible with membrane and adhesives.

H. Lap Sealants and Tapes: As recommended by flashing manufacturer; compatible with membrane and adhesives.

2.6 ACCESSORIES

A. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.

1. Mortar Diverter: Semi-rigid mesh designed for installation at flashing locations.

a. Manufacturers:

1) Advanced Building Products Inc; Mortar Break DT: www.advancedbuildingproducts.com/#sle.
2) Mortar Net Solutions; MortarNet: www.mortarnet.com/#sle.
3) York Manufacturing, Inc Weep-Net: www.yorkmfg.com/#sle.
4) Architect pre-approved equivalent.

2. Bond Breaker Strips: ASTM D226/D226M, Type I ("No.15") asphalt felt.

B. Weeps: Cotton rope.

C. Cavity Vents:

1. Type: Molded PVC grilles, insect resistant, UV-resistant, full height and width of head joints and depth; 1/8" less than depth of outer wythe.
2. Color: As selected by Architect/Engineer from manufacturer's full range.

D. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

E. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.7 MORTAR AND GROUT MIXES

A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.

1. For all concrete masonry, use Type S.
2. For all clay brick, use Type N.

B. Grout: ASTM C476. Consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive masonry.

3.2 COLD AND HOT WEATHER REQUIREMENTS

A. Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

3.3 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Concrete Masonry Units:

1. Bond: As indicated for different locations.
2. Coursing: One unit and one mortar joint to equal 8 inches.
3. Mortar Joints: Concave.

D. Brick Units:

1. Bond: Running.
2. Coursing: Three units and three mortar joints to equal 8 inches or as required to match existing.
3. Mortar Joints: Concave.

3.4 PLACING AND BONDING

A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

B. Lay hollow masonry units with face shell bedding on head and bed joints.

C. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.

D. Remove excess mortar and mortar smears as work progresses.

E. Remove excess mortar with water repellent admixture promptly. Do not use acids, sandblasting or high pressure cleaning methods.

F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

G. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

3.5 WEEPS/CAVITY VENTS

A. Install weeps in veneer and cavity walls at 24 inches on center horizontally above through-wall flashing, above shelf angles and lintels, and at bottom of walls.

B. Install cavity vents in veneer and cavity walls at 32 inches on center horizontally below shelf angles and lintels and near top of walls.

3.6 CAVITY MORTAR CONTROL

A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

3.7 REINFORCEMENT AND ANCHORAGE - GENERAL

A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.

3.8 REINFORCEMENT AND ANCHORAGES - MULTIPLE WYTHE UNIT MASONRY

A. Use individual metal ties installed in horizontal joints to bond wythes together. Provide ties spaced at 16" on center.

B. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.

3.9 MASONRY FLASHINGS

A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.

B. Install flashing in accordance with manufacturer's instructions and BIA Technical Notes No. 7.

C. Extend metal flashings to within 1/4 inch of exterior face of masonry.

D. Lap end joints of flashings at least 6 inches and seal watertight with mastic or elastic sealant.

3.10 CLEANING AND REPAIR

A. Remove excess mortar, mortar smears and mortar droppings.

B. Replace defective mortar. Match adjacent work in color and joint profile.

C. Clean soiled surfaces with cleaning solution. Protect adjacent or dissimilar materials from damage from cleaning activities.

D. Use non-metallic tools in cleaning operations.

END OF SECTION

SECTION 06 1000
ROUGH CARPENTRY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Nonstructural dimension lumber framing.

B. Sheathing.

C. Fire retardant treated wood materials.

D. Communications and electrical room mounting boards.

E. Concealed wood blocking, nailers, and supports.

1.2 REFERENCE STANDARDS

A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.

C. AWPA U1 - Use Category System: User Specification for Treated Wood; 2022.

D. PS 1 - Structural Plywood; 2009 (Revised 2019).

E. PS 2 - Performance Standard for Wood Structural Panels; 2018.

F. PS 20 - American Softwood Lumber Standard; 2021.

G. SPIB (GR) - Standard Grading Rules; 2021.

1.3 SUBMITTALS

A. See Division 01 for submittal procedures.

B. Product Data: Provide technical data on fire-retardant treatment materials.

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.

B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, and installation.

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. Grading Agency: Southern Pine Inspection Bureau, Inc; SPIB (GR).

B. Sizes: Nominal sizes as indicated on drawings, S4S.

C. Moisture Content: S-dry or MC19.

D. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:

1. Lumber: S4S, No. 2 or Standard Grade.

2. Boards: Standard or No. 3.

3. Fire Retardant Treated.

2.3 CONSTRUCTION PANELS

A. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

1. Fire Retardant Treated

2.4 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.

2. Drywall Screws: Bugle head, hardened steel, power driven type, length three times thickness of sheathing.

3. Anchors: Toggle bolt type for anchorage to hollow masonry.

2.5 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. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.

B. Fire Retardant Treatment:

1. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.

a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.

b. Interior rough carpentry items are to be fire retardant treated.

c. Treat rough carpentry items as indicated .

d. Do not use treated wood in applications exposed to weather or where the wood may become wet.

PART 3 EXECUTION

3.1 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.

3.2 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In 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. Provide the following specific nonstructural framing and blocking:

1. Cabinets and shelf supports.
2. Wall brackets.
3. Handrails.
4. Grab bars.
5. Wall-mounted door stops.
6. Chalkboards and marker boards.
7. Wall paneling and trim.
8. Joints of rigid wall coverings that occur between studs.
9. Blocking at wall openings.

3.3 INSTALLATION OF CONSTRUCTION PANELS

A. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches 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.

3.4 TOLERANCES

A. Framing Members: 1/4 inch from true position, maximum.

B. Variation from Plane, Other than Floors: 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

3.5 CLEANING

A. Waste Disposal:

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

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

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

END OF SECTION

SECTION 07 8100
APPLIED FIRE PROTECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Applied fire protection of existing interior structural steel and underside of existing metal rib lath at floor/ceiling and roof as indicated on drawings.

1.2 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping.

1.3 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.

B. ASTM E605/E605M - Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members; 2019 (Reapproved 2023).

C. ASTM E736/E736M - Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members; 2019 (Reapproved 2023).

D. ASTM E759/E759M - Standard Test Method for Effect of Deflection on Sprayed Fire-Resistive Material Applied to Structural Members; 1992 (Reapproved 2023).

E. ASTM E760/E760M - Standard Test Method for Effect of Impact on Bonding of Sprayed Fire-Resistive Material Applied to Structural Members; 1992 (Reapproved 2023).

F. ASTM E761/E761M - Standard Test Method for Compressive Strength of Sprayed Fire-Resistive Material Applied to Structural Members; 1992 (Reapproved 2023).

G. ASTM E859/E859M - Standard Test Method for Air Erosion of Sprayed Fire-Resistive Materials (SFRMs) Applied to Structural Members; 2023.

H. ASTM E937/E937M - Standard Test Method for Corrosion of Steel by Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members; 1993 (Reapproved 2023).

I. UL (FRD) - Fire Resistance Directory; Current Edition.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with placement of ceiling hanger tabs, mechanical component hangers, and electrical components.

B. Preinstallation Meeting: Convene one week before starting work of this section.

1.5 SUBMITTALS

A. See Section 01 3300 - Submittal Procedures, for submittals procedures.

B. Product Data: Provide data indicating product characteristics.

C. Test Reports: Reports from reputable independent testing agencies for proposed products, indicating compliance with specified criteria, conducted under conditions similar to those on project, as follows:

1. Bond strength.
2. Bond impact.
3. Compressive strength.
4. Fire tests using substrate materials similar those on project.

1.6 FIELD CONDITIONS

A. Do not apply fireproofing when temperature of substrate material and surrounding air is below 40 degrees F or when temperature is predicted to be below said temperature for 24 hours after application.

B. Provide ventilation in areas to receive fireproofing during application and 24 hours afterward, to dry applied material.

C. Provide temporary enclosure to prevent spray from contaminating air.

D. Do not allow roof traffic during installation of roof fireproofing and drying period.

1.7 WARRANTY

A. See Section 01 7700 - Closeout Procedures, for additional warranty requirements.

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

1. Include coverage for fireproofing to remain free from cracking, checking, dusting, flaking, spalling, separation, and blistering.
2. Reinstall or repair failures that occur within warranty period.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Applied Fire Protection:

1. Isolatek International Corp: www.isolatek.com/#sle.
2. Architect pre-approved equivalent.

2.2 APPLIED FIRE PROTECTION ASSEMBLIES

A. Provide assemblies as indicated on drawings.

B. Provide fire resistance ratings for following building elements as required by local building code:

1. Primary structural frame, including columns, girders, and trusses, 1 hour.
2. Bearing walls, exterior, 1 hour.
3. Bearing walls, interior, 1 hour.
4. Floor construction, including supporting beams and joists, 1 hour.
5. Roof construction, including supporting beams and joists, 1 hour.

2.3 MATERIALS

A. Applied Fire Protection Material for Interior Applications, Concealed: Manufacturer's standard factory mixed material, which when combined with water is capable of providing indicated fire resistance, and complying with following requirements:

1. Bond Strength: 150 pounds per square foot, minimum, when tested in accordance with ASTM E736/E736M when set and dry.
2. Density: When tested in accordance with ASTM E605, the material shall meet the minimum individual and average density values as listed in the appropriate UL design or as required by the authority having jurisdiction.
3. Compressive Strength: When tested in accordance with ASTM E761, the material shall not deform more than 10 percent when subjected to a crushing force of 1,440 psf..
4. Effect of Impact on Bonding: No cracking, spalling or delamination, when tested in accordance with ASTM E760/E760M.
5. Corrosivity: When tested in accordance with ASTM E937, the material shall not promote corrosion of steel.
6. Air Erosion Resistance: Weight loss of 0.025 g/sq ft, maximum, when tested in accordance with ASTM E859/E859M after 24 hours.
7. Surface Burning Characteristics: Maximum flame spread index of 0 (zero) and maximum smoke developed index of 0 (zero), when tested in accordance with ASTM E84.
8. Effect of Deflection: No cracking, spalling, or delamination, when tested in accordance with ASTM E759/E759M.

2.4 ACCESSORIES

A. Primer Coating: Of type recommended by applied fire protection manufacturer.

B. Metal Lath: Expanded metal lath; as required by tested UL assembly.

C. Water: Clean, potable.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive fireproofing.

B. Verify that clips, hangers, supports, sleeves, and other items required to penetrate fireproofing are in place.

C. Verify that ducts, piping, equipment, or other items that would interfere with application of fireproofing have not been installed.

D. Verify that voids and cracks in substrate have been filled.

E. Verify that projections have been removed where fireproofing will be exposed to view as a finish material.

3.2 PREPARATION

A. Perform tests as recommended by fireproofing manufacturer in applications where adhesion of fireproofing to substrate is in question.

B. Remove incompatible materials that could effect bond by scraping, brushing, scrubbing, or sandblasting.

C. Prepare substrates to receive fireproofing in strict accordance with instructions of fireproofing manufacturer.

D. Apply fireproofing manufacturer's recommended bonding agent on primed steel.

E. Protect surfaces not scheduled for fireproofing and equipment from damage by overspray, fall-out, and dusting.

F. Close off and seal duct work in areas where fireproofing is being applied.

3.3 APPLICATION

A. Install metal lath over structural members as indicated or as required by UL Assembly Design Numbers.

B. Apply primer coating in accordance with manufacturer's instructions.

C. Apply fireproofing in uniform thickness and density as necessary to achieve required ratings.

3.4 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 01 4000 - Quality Requirements.

B. Inspect installed fireproofing after application and curing for integrity, prior to its concealment.

C. Ensure that actual thicknesses, densities, and bond strengths meet requirements for specified ratings and requirements of authorities having jurisdiction (AHJ).

D. Re-inspect installed fireproofing for integrity of fire protection, after installation of subsequent Work.

3.5 CLEANING

A. Remove excess material, overspray, droppings, and debris.

B. Remove fireproofing from materials and surfaces not required to be fireproofed.

END OF SECTION

SECTION 07 8400
FIRESTOPPING

PART 1 GENERAL

1.1 SECTION INCLUDES

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

1.2 REFERENCE STANDARDS

A. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems 2013a (Reapproved 2017).

B. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems 2015 (Reapproved 2019).

C. ASTM E2307 - Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus 2020.

D. ASTM E2837 - Standard Test Method for Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed Between Rated Wall Assemblies and Nonrated Horizontal Assemblies 2013 (Reapproved 2017).

E. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi 2015, with Editorial Revision (2021).

F. ITS (DIR) - Directory of Listed Products current edition.

G. FM (AG) - FM Approval Guide current edition.

H. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems Current Edition, Including All Revisions.

I. UL (FRD) - Fire Resistance Directory Current Edition.

1.3 SUBMITTALS

A. See Division 01 for submittal procedures.

B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.

C. Product Data: Provide data on product characteristics, performance ratings, and limitations.

1.4 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated.

1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.

2. Valid evaluation report published by ICC Evaluation Service, Inc. (ICC-ES) at www.icc-es.org will be considered as constituting an acceptable test report.

1.5 FIELD CONDITIONS

A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.

B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Firestopping Manufacturers:

1. 3M Fire Protection Products: www.3m.com/firestop/#sle.
2. Hilti, Inc: www.us.hilti.com/#sle.
3. Nelson FireStop Products: www.nelsonfirestop.com/#sle.
4. Architect pre-approved equivalent.

2.2 MATERIALS

A. Mold and Mildew Resistance: Provide firestopping materials with mold and mildew resistance rating of zero (0) in accordance with ASTM G21.

B. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

C. Fire Ratings: Refer to drawings for required systems and ratings.

2.3 FIRESTOPPING ASSEMBLY REQUIREMENTS

A. Head-of-Wall (HW) Joint System Firestopping at Joints Between Fire-Rated Wall Assemblies and Non-Rated Horizontal Assemblies: Use system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of wall assembly.

B. Floor-to-Floor (FF), Floor-to-Wall (FW), Head-of-Wall (HW), and Wall-to-Wall (WW) Joints, Except Perimeter, Where Both Are Fire-Rated: Use system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.

C. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.

PART 3 EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

3.3 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

END OF SECTION

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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.

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 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. Manufacturer's standard warranty covering sealant materials.

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. Architect pre-approved equivalent.

2.2 SILICONE SEALANTS

A. Single Component Silicone Basis-of-Design: Dow Corning Dowsil 795 Silicone Building Sealant, color as selected, at exterior and interior perimeter of windows and doors.

2.3 POLYURETHANE SEALANTS

A. Single Component Non-Sag Polyurethane Basis-of-Design: MasterSeal NP 1 (formerly known as Sonolastic NP 1), color as selected, at locations other than exterior and interior perimeter of windows and doors.

B. ACCESSORIES

1. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
2. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
3. 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
4. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.
5. 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 1113
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.1 SECTION INCLUDES

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

B. Fire-rated hollow metal doors and frames.

1.2 ABBREVIATIONS AND ACRONYMS

A. ANSI: American National Standards Institute.

B. HMMA: Hollow Metal Manufacturers Association.

C. NAAMM: National Association of Architectural Metal Manufacturers.

D. NFPA: National Fire Protection Association.

E. SDI: Steel Door Institute.

F. UL: Underwriters Laboratories.

1.3 REFERENCE STANDARDS

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

B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors 2018.

C. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames 2015.

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

E. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames 2020.

F. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.

G. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.

H. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable 2021a.

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

J. BHMA A156.115 - Hardware Preparation In Steel Doors And Steel Frames 2016.

K. ICC A117.1 - Accessible and Usable Buildings and Facilities 2017.

L. ITS (DIR) - Directory of Listed Products current edition.

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

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

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

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

Q. NFPA 80 - Standard for Fire Doors and Other Opening Protectives 2022.

R. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives 2022.

S. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies 2022.

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

U. UL (DIR) - Online Certifications Directory Current Edition.

V. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies Current Edition, Including All Revisions.

W. UL 1784 - Standard for Air Leakage Tests of Door Assemblies Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Division 01 for submittal procedures.

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

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, anchorage, connections, and identifying location of different finishes, if any.

1.5 QUALITY ASSURANCE

A. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252.

1.6 DELIVERY, STORAGE, AND HANDLING

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

B. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch (102 mm) high wood blocking. Do not store in manner that traps excess humidity.

1. Provide minimum 1/4 inch (6 mm) space between each stacked door to permit air circulation.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com/#sle.
2. Curries, an Assa Abloy Group company: www.assaabloydss.com/#sle.
3. Republic Doors, an Allegion brand: www.republicdoor.com/#sle.
4. Steelcraft, an Allegion brand: www.allegion.com/#sle.
5. Architect pre-approved equivalent.

2.2 PERFORMANCE REQUIREMENTS

A. Requirements for Hollow Metal Doors and Frames:

1. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
2. Accessibility: Comply with ICC A117.1 and ADA Standards.
3. Door Top Closures: Flush end closure channel, with top and door faces aligned.
4. Door Edge Profile: Manufacturers standard for application indicated.
5. Typical Door Face Sheets: Flush.
6. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
7. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40z (12G) coating designation; mill phosphatized.

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

2.3 HOLLOW METAL DOORS

A. Door Finish: Factory primed and field finished.

B. Interior Doors, Non-Fire-Rated:

1. Based on SDI Standards: ANSI/SDI A250.9 (SDI-100)
   a. Level 2 - Heavy-Duty.

b. Physical Performance Level B 500,000 cycles; in accordance with ANSI/SDI A250.4.

c. Model 2, seamless design, continuously welded seam dressed smooth.

d. Door Face Metal Thickness: 18-gauge, 0.042 inch (1.0 mm), minimum.

2. Door Core Material: Manufacturer's standard core material/construction and in compliance with requirements.

3. Door Thickness: 1-3/4 inches (44.5 mm), nominal.

C. Interior Doors, Fire-Rated:

1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).

a. Level 2 - Heavy-duty.

b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.

c. Model 2, seamless design, continuously welded seam dressed smooth.

d. Door Face Metal Thickness: 18 gauge, 0.042 inch (1.0 mm), minimum.

2. Fire Rating: As indicated on Door Schedule, tested in accordance with UL 10C and NFPA 252 ("positive pressure fire tests").

a. Temperature-Rise Rating (TRR) Across Door Thickness: In accordance with local building code and authorities having jurisdiction.

b. Provide units listed and labeled by UL (DIR) or ITS (DIR).

c. Attach fire rating label to each fire rated unit.

d. Smoke and Draft Control Doors (including all fire-rated doors): Self-closing or automatic closing doors in accordance with NFPA 80 and NFPA 105, with fire-resistance-rated wall construction rated the same or greater than the fire-rated doors, and the following;

1) Maximum Air Leakage: 3.0 cfm/sq ft (0.02 cu m/sec/sq m) of door opening at 0.10 inch w.g. (24.9 Pa) pressure, when tested in accordance with UL 1784 at both ambient and elevated temperatures.
2) Gasketing: Provide gasketing or edge sealing as necessary to achieve leakage limit.
3) Label: Include the "S" label on fire-rating label of door.

3. Door Core Material: Manufacturers standard core material/construction in compliance with requirements.

4. Door Thickness: 1-3/4 inches (44.5 mm), nominal.

5. Door Face Sheets: Flush.

2.4 HOLLOW METAL FRAMES

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

B. Frame Finish: Factory primed and field finished.

C. Interior Door Frames, Non-Fire Rated: Full proile/continuously welded type.

1. Frame Metal Thickness: 16 gauge, 0.053 inch (1.3 mm), minimum.

D. Interior Door Frames, Fire-Rated: Full profile/continuously welded type.

1. Fire Rating: Same as door, labeled.
2. Frame Metal Thickness: 16 gauge, 0.053 inch (1.3 mm), minimum.

E. Frames Wider than 48 inches: Reinforce with steel channel fitted tightly into frame head, flush with top.

2.5 FINISHES

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

2.6 ACCESSORIES

A. Mechanical Fasteners for Concealed Metal-to-Metal Connections: Self-drilling, self-tapping, steel with electroplated zinc finish.

B. Exposed Fasteners: Provide countersunk, flat- or oval-head screws and bolts for exposed fasteners unless otherwise indicated.

C. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A153/A153M.

D. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.

E. Frame Anchors:

1. Jamb Anchors:

a. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch (1.0 mm) thick.

b. Provide number and spacing of jamb anchors as follows:

1) Fire ratings may require additional anchors.
2) Stud-Wall Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:
(a) Three anchors per jamb up to 60 inches (1524 mm) high.
(b) Four anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
(c) Five anchors per jamb from 90 to 96 inches (2286 to 2438 mm) high.
(d) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 96 inches (2438 mm) high.
(e) Two anchors per head for frames above 42 inches (1066 mm) wide and mounted in metal-stud partitions.

2. Floor Anchors: Formed from same material as frames, not less than 0.042 inch (1.0 mm) thick, and as follows:

a. Attachment: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.

b. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

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

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

2.7 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.

C. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Section 08 7100.

1. Reinforce doors and frames to receive non-templated, mortised and surface-mounted door hardware.
2. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
3. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 and Division 28 Sections.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

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

D. Examine rough-in for embedded and built-in anchors to verify actual locations before frame installation.

E. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the requirements listed in Tolerances article below.

C. Drill and tap doors and frames to receive non-templated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

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

B. Install fire rated units in accordance with NFPA 80.

C. Smoke-Control Doors: Install doors according to NFPA 105.

D. Coordinate frame anchor placement with wall construction.

E. Install door hardware as specified in Section 08 7100.

1. Comply with recommended practice for hardware placement of doors and frames in accordance with ANSI/SDI A250.6 or NAAMM HMMA 861.

F. Coordinate installation of electrical connections to electrical hardware items.

G. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.

1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

a. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.

H. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

a. Jambs and Head: 1/8 inch (3 mm) plus or minus 1/16 inch (1.6 mm).

b. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch (9.5 mm).

c. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch (19 mm).

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

3. Smoke-Control Doors: Install doors according to NFPA 105.

3.4 TOLERANCES

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

B. Maximum Diagonal Distortion: 1/16 inch (1.6 mm) measured with straight edge, corner to corner.

C. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.

D. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.

E. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.

F. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.

3.5 ADJUSTING

A. Adjust for smooth and balanced door movement.

B. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

C. SCHEDULE

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

END OF SECTION

SECTION 08 7100
DOOR HARDWARE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Hardware for hollow metal doors.

B. Hardware for fire-rated doors.

1.2 REFERENCE STANDARDS

A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.

B. BHMA A156.1 - Standard for Butts and Hinges; 2021.

C. BHMA A156.4 - Door Controls - Closers; 2019.

D. BHMA A156.6 - Standard for Architectural Door Trim; 2021.

E. BHMA A156.8 - Door Controls - Overhead Stops and Holders; 2021.

F. BHMA A156.18 - Materials and Finishes; 2020.

G. BHMA A156.115 - Hardware Preparation in Steel Doors and Steel Frames; 2016.

H. DHI (LOCS) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames; 2004.

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

J. ITS (DIR) - Directory of Listed Products; current edition.

K. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2022.

L. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

M. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2022.

N. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.

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

P. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

1.3 ADMINISTRATIVE REQUIREMENTS

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

1.4 SUBMITTALS

A. See Division 01 for submittal procedures.

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

C. Shop Drawings - Door Hardware Schedule: Submit detailed listing that includes each item of hardware to be installed on each door. Use door numbering scheme as included in Contract Documents.

1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
2. Provide complete description for each door listed.

D. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

E. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

1. Submit manufacturer's parts lists and templates.

F. Maintenance Materials and Tools: Furnish the following for Owner's use in maintenance of project.

1. See Division 01 for additional provisions.

1.5 DELIVERY, STORAGE, AND HANDLING

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

1.6 WARRANTY

A. See Division 01 for additional warranty requirements.

B. Manufacturer's Warranty: Provide warranty against defects in material and workmanship for period indicated. Complete forms in Owner's name and register with manufacturer.

1. Closers: Five years, minimum.
2. Exit Devices: Three years, minimum.
3. Other Hardware: Two years, minimum.

PART 2 PRODUCTS

2.1 DESIGN AND PERFORMANCE CRITERIA

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

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

C. Provide door hardware products that comply with the following requirements:

1. Applicable provisions of federal and state codes.
2. Accessibility: ADA Standards and ICC A117.1.
3. Applicable provisions of NFPA 101.
4. Fire-Rated Doors: NFPA 80, listed and labeled by qualified testing agency for fire protection ratings indicated, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
5. Hardware on Fire-Rated Doors: Listed and classified by UL (DIR), ITS (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for application indicated.

6. Hardware Preparation for Steel Doors and Steel Frames: BHMA A156.115.

D. Fasteners:

1. Provide fasteners of proper type, size, quantity, and finish that comply with commercially recognized standards for proposed applications.
   a. Aluminum fasteners are not permitted.
   b. Provide phillips flat-head screws with heads finished to match door surface hardware unless otherwise indicated.
2. Fire-Rated Applications: Comply with NFPA 80.
   a. Provide wood or machine screws for hinges mortised to doors or frames, strike plates to frames, and closers to doors and frames.
   b. Provide steel through bolts for attachment of surface mounted closers, hinges, or exit devices to door panels unless proper door blocking is provided.

2.2 HINGES

A. Manufacturers:

1. McKinney; an Assa Abloy Group company: www.assaabloydss.com/#sle.
2. Bommer Industries, Inc: www.bommer.com/#sle.
3. Hager Companies: www.hagerco.com/#sle.
4. Stanley, dormakaba Group: www.stanleyhardwarefordoors.com/#sle.
5. Architect pre-approved equivalent.

B. Hinges: Comply with BHMA A156.1, Grade 1.

1. Provide hinges on every swinging door.
2. Provide following quantity of butt hinges for each door:
   a. Doors From 60 inches High up to 90 inches High: Three hinges.
3. 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" heavy weight as specified.
   b. Widths from 3'-1" to 4'-0": 5" heavy weight as specified.

2.3 MORTISE LOCKS

A. Locks to be provided by Owner.

2.4 CLOSERS

A. Manufacturers; Surface Mounted:

1. Corbin Russwin, Norton, Rixson, Sargent, or Yale; an Assa Abloy Group company: www.assaabloydss.com/#sle.
2. DORMA USA, Inc; 7400 Series, 8600 Series, 8900 Series, and TS93: www.dorma.com/#sle.
3. Hager Companies: www.hagerco.com/#sle.

4. LCN, an Allegion brand: www.allegion.com/us/#sle.
5. Stanley, dormakaba Group: www.stanleyhardwarefordoors.com/#sle.
6. Architect pre-approved equivalent.

B. Closers: Comply with BHMA A156.4, Grade 1.

1. Type: Surface mounted to door.
2. Provide door closer on each exterior door.

2.5 OVERHEAD STOPS AND HOLDERS

A. Manufacturers:

1. Rixson or Sargent; an Assa Abloy Group company: www.assaabloydss.com/#sle.
2. DORMA USA, Inc; 900 Series: www.dorma.com/#sle.
3. Glynn-Johnson, an Allegion brand: www.allegion.com/us/#sle.
4. Architect pre-approved equivalent.

B. Overhead Stops and Holders (Door Checks): Comply with BHMA A156.8, Grade 1.

1. Provide stop for every swinging door, unless otherwise indicated.

2.6 PROTECTION PLATES

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

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

C. Fasteners: Countersunk screw fasteners.

2.7 KICK PLATES

A. Manufacturers:

1. Hiawatha, Inc, an Activar Construction Products Group company: www.activarcpg.com/hiawatha/#sle.
2. Ives, an Allegion brand: www.allegion.com/us/#sle.
3. Architect pre-approved equivalent.

B. Kick Plates: Provide along bottom edge of push side of every door with closer, except aluminum storefront and glass entry doors, unless otherwise indicated.

1. Size: 8 inch high by 2 inch less door width (LDW) on push side of door, unless noted otherwise.

2.8 SILENCERS

A. Manufacturers:

1. Ives, an Allegion brand: www.allegion.com/us/#sle.
2. Rockwood; an Assa Abloy Group company: www.assaabloydss.com/#sle.
3. Architect pre-approved equivalent.

B. Silencers: Provide at equal locations on door frame to mute sound of door's impact upon closing.

1. Single Door: Provide three on strike jamb of frame.
2. Pair of Doors: Provide two on head of frame, one for each door at latch side.
3. Material: Rubber, black color.

2.9 FINISHES

A. Finishes: Provide door hardware of same finish, unless otherwise indicated.

1. Primary Finish: 626; satin chromium plated over nickel, with brass or bronze base material (former US equivalent US26D); BHMA A156.18.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that doors and frames are ready to receive this work; labeled, fire-rated doors and frames are properly installed, and dimensions are as indicated on shop drawings.

B. Verify that electric power is available to power operated devices and of correct characteristics.

3.2 INSTALLATION

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

B. Install hardware on fire-rated doors and frames in accordance with applicable codes and NFPA 80.

C. Install hardware for smoke and draft control doors in accordance with NFPA 105.

D. Use templates provided by hardware item manufacturer.

E. Do not install surface mounted items until application of finishes to substrate are fully completed.

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

1. For Steel Doors and Frames: Install in compliance with DHI (LOCS) recommendations.
2. Mounting heights in compliance with ADA Standards:

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

3.3 FIELD QUALITY CONTROL

A. Perform field inspection and testing under provisions of Division 01.

B. Provide an Architectural Hardware Consultant (AHC) to inspect installation and certify that hardware and installation has been furnished and installed in accordance with manufacturer's instructions and as specified.

3.4 ADJUSTING

A. Adjust work under provisions of Division 01.

B. Adjust hardware for smooth operation.

C. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

3.5 CLEANING

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

B. Clean adjacent surfaces soiled by hardware installation.

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

3.6 PROTECTION

A. Protect finished Work under provisions of Division 01.

B. Do not permit adjacent work to damage hardware or finish.

END OF SECTION

SECTION 08 8813
FIRE-RATED GLAZING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fire-rated glazing units.

B. Glazing compounds.

1.2 RELATED REQUIREMENTS

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

1.3 REFERENCE STANDARDS

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

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).

C. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2015).

D. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.

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

F. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2022.

G. GANA (GM) - GANA Glazing Manual; 2008.

H. GANA (SM) - GANA Sealant Manual; 2008.

I. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. ITS (DIR) - Directory of Listed Products; current edition.

K. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2022.

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

M. UL 10B - Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

N. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

O. UL 263 - Standard for Fire Tests of Building Construction and Materials; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Division 01 for submittal procedures.

B. Product Data on Glazing Unit Glazing Types: Provide structural, physical, and environmental characteristics, size limitations, special handling and installation requirements.

C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

D. Specimen warranty.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with GANA (GM) and GANA (SM) for glazing installation methods. Maintain one copy on site.

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

1.6 WARRANTY

A. See Division 01 for additional warranty requirements.

B. Fire-resistance-rated glazing: Provide a three-year manufacturer warranty.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Fire-Resistance-Rated Glass:

1. Manufacturers:

a. SAFTIFIRST, a division of O'Keeffe's Inc; SuperLite II-XL: www.safti.com/#sle.

b. Technical Glass Products; Pilkington Pyrostop: www.fireglass.com/#sle.

c. Vetrotech North America; Contraflam 60: www.vetrotechusa.com/#sle.

d. Architect pre-approved equivalent..

2.2 GLASS MATERIALS

A. Float Glass: Provide float glass based glazing unless otherwise indicated.

1. Kind FT - Fully Tempered Type: Comply with ASTM C1048.

2. Impact-Resistant Safety Glass: Comply with ANSI Z97.1 - Class B, or 16 CFR 1201 - Category I criteria.

2.3 GLAZING UNITS

A. Type FRG-1 - Fire-Resistance-Rated Glazing: Type, thickness, and configuration of glazing that contains flames, smoke, and blocks radiant heat, as required to achieve indicated fire rating period exceeding 45 minutes.

1. Applications:

a. Glazing in fire-rated door assembly.

2. Glass Type: Multi-laminate clear tempered glass protecting a clear, fire resistive, intumescent interlayer.
3. Provide products listed by ITS (DIR) or UL (DIR) and approved by authorities having jurisdiction.
4. Safety Glazing Certification: 16 CFR 1201 Category II.
5. Fire Rating Period: 60 minutes.
6. Markings for Fire-Resistance-Rated Glazing Assemblies: Provide permanent markings on fire-resistance-rated glazing in compliance with ICC (IBC), local building code, and authorities having jurisdiction.
    a. "W" - meets wall assembly criteria of ASTM E119 or UL 263 fire test standards.
    b. "D" - meets fire door assembly criteria of NFPA 252, UL 10B, or UL 10C fire test standards.
    c. "H" - meets fire door assembly hose stream test of NFPA 252, UL 10B, or UL 10C fire test standards.
    d. 'T' - meets temperature rise of not more than 450 degrees F above ambient at end of 30 minutes fire exposure in accordance with NFPA 252, UL 10B, or UL 10C fire test standards.
    e. "XXX" - placeholder that represents fire rating period, in minutes.
7. Products:
    a. SAFTIFIRST, a division of O'Keeffe's Inc; SuperLite II-XL 60: www.safti.com/#sle.
    b. SAFTIFIRST, a division of O'Keeffe's Inc; SuperLite II-XLM 60: www.safti.com/#sle.
    c. Technical Glass Products; Pilkington Pyrostop 60: www.fireglass.com/#sle.
    d. Vetrotech North America; Contraflam 60: www.vetrotechusa.com/#sle.
    e. Architect pre-approved equivalent.

2.4 ACCESSORIES

A. Setting Blocks: Aluminum silicate, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Continuous by one half the height of glazing stop by thickness to suit application, self adhesive on one face.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

C. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.3 INSTALLATION - GENERAL

A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers unless more stringent requirements are indicated, including those in referenced glazing standards.

B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

C. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.

D. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.

E. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.

F. Prevent glass from contact with contaminating substances that may result from construction operations including, but not limited to weld spatter, fire-safing, plastering, mortar droppings, etc.

3.4 CLEANING

A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

B. Remove nonpermanent labels immediately after glazing installation is complete.

C. Clean glass and adjacent surfaces after sealants are fully cured.

D. Clean glass on both exposed surfaces not more than four days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

END OF SECTION

SECTION 09 2116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.

B. Metal stud wall framing.

C. Metal channel ceiling framing.

D. Gypsum wallboard.

E. Joint treatment and accessories.

1.2 REFERENCE STANDARDS

A. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members 2016, with Supplement (2018).

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2020.

C. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board 2017.

D. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members 2018.

E. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products 2020.

F. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board 2020.

G. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness 2018.

H. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs 2020.

I. ASTM C1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base 2019.

J. ASTM C1396/C1396M - Standard Specification for Gypsum Board 2017.

K. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber 2016.

L. GA-216 - Application and Finishing of Gypsum Panel Products 2018.

1.3 SUBMITTALS

A. See Division 01 for submittal procedures.

B. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.

C. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

PART 2 PRODUCTS

2.1 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.

B. Fire-Resistance-Rated Assemblies: Provide completed assemblies complying with applicable code.

1. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL (FRD).

2.2 METAL FRAMING MATERIALS

A. Non-structural Framing System Components: AISI S220; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf (L/120 at 240 Pa).

1. Studs: C-shaped with knurled or embossed faces.
2. Runners: U shaped, sized to match studs.
3. Ceiling Channels: C-shaped.

B. Shaft Wall Studs and Accessories: AISI S220; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 and specified perfornance requirements.

C. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection using slotted holes, screws, and anti-friction bushings, preventing rotation of studs while maintaining structural performance of partition.

1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI S100.
2. Material: ASTM A653/A653M steel sheet, SS Grade 50/340, with G60/Z180 hot-dipped galvanized coating.
3. Provide mechanical anchorage devices as described above that accommodate deflection while maintaining the fire-resistance rating of the wall assembly.
    a. Products:
        1) ClarkDietrich; BlazeFrame RipTrak: www.clarkdietrich.com/#sle.
        2) FireTrak Corporation; Posi Klip: www.fire-trak.com/#sle.
        3) Metal-Lite, Inc; The System: www.metal-lite.net/#sle.
        4) Architect pre-approved equivalent.

2.3 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:

1. American Gypsum Company: www.americangypsum.com/#sle.
2. Georgia-Pacific Gypsum: www.gpgypsum.com/#sle.
3. National Gypsum Company: www.nationalgypsum.com/#sle.

4. USG Corporation: www.usg.com/#sle.
5. Architect pre-approved equivalent.

B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.

1. Application: Use for vertical surfaces, 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. At Assemblies Indicated with Fire-Resistance Rating: Use type required by indicated tested assembly; if no tested assembly is indicated, use Type X board, UL or WH listed.
4. Thickness:
    a. Vertical Surfaces: 5/8 inch (16 mm).

C. Shaftwall and Coreboard: Type X; 1 inch thick by 24 inches wide, beveled long edges, ends square cut.

1. Paper-Faced Type: Gypsum shaftliner board or gypsum coreboard as defined in ASTM C1396/C1396M; water-resistant faces.

2.4 GYPSUM WALLBOARD ACCESSORIES

A. Finishing Accessories: ASTM C1047, extruded aluminum alloy (6063 T5) or galvanized steel sheet ASTM A924/A924M G90, unless noted otherwise.

1. Types: As detailed or required for finished appearance.
2. Special Shapes: In addition to conventional corner bead and control joints, provide U-bead at exposed panel edges.

B. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.

1. Paper Tape: 2 inch (50 mm) wide, creased paper tape for joints and corners, except as otherwise indicated.
2. Joint Compound: Drying type, vinyl-based, ready-mixed.

C. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches (0.84 mm) in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.

D. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch (0.84 to 2.84 mm) in Thickness: ASTM C954; steel drill screws, corrosion-resistant.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.2 SHAFT WALL INSTALLATION

A. Shaft Wall Framing: Install in accordance with manufacturer's installation instructions.

B. Shaft Wall Liner: Cut panels to accurate dimensions and install sequentially between special friction studs.

3.3 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.

B. Studs: Space studs at 16 inches on center (at 406 mm on center).

1. Extend partition framing to structure in all locations.

2. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.

C. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

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. Installation on Metal Framing: Use screws for attachment of gypsum board.

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.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.6 JOINT TREATMENT

A. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.

B. 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.

C. 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 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.

END OF SECTION

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SECTION 09 5100
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

1.2 REFERENCE STANDARDS

A. ASTM C635/C635M - Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2022.

B. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2013.

C. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2020.

D. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2022.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

B. Do not install acoustical units until after interior wet work is dry.

1.4 SUBMITTALS

A. Product Data: Provide data on suspension system components and acoustical units.

B. Samples: Submit two samples 4 by 4 inch in size illustrating material and finish of acoustical units.

C. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. Extra Acoustical Units: Quantity equal to 5 percent of total installed.

1.5 QUALITY ASSURANCE

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

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

1.6 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acoustic Tiles/Panels:

1. Armstrong World Industries, Inc: www.armstrongceilings.com/#sle.
2. CertainTeed Corporation: www.certainteed.com/ceilings-and-walls/#sle.
3. Rockfon: www.rockfon.com/#sle.
4. USG Corporation: www.usg.com/ceilings/#sle.
5. Architect Pre-Approved Equivalent.

B. Suspension Systems:

1. Same as for acoustical units.

2.2 ACOUSTICAL UNITS

A. Acoustical Panels: Painted mineral fiber, with the following characteristics:

1. Classification: ASTM E1264 Type III.
2. Size: 24 by 24 inches.
3. Thickness: 3/4 inch.
4. Panel Edge: Square.
5. Suspension System: Exposed grid.
6. Products:

a. Basis-of-DesignUSG Corporation; Radar Acoustical Panels: www.usg.com/ceilings/#sle.

2.3 SUSPENSION SYSTEM(S)

A. Metal Suspension Systems - General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.

2.4 ACCESSORIES

A. Hanger Wire: 12 gauge, 0.08 inch galvanized steel wire.

B. Perimeter Moldings: Same metal and finish as grid.

C. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.2 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636/C636M, ASTM E580/E580M, and manufacturer's instructions and as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

C. Locate system on room axis according to reflected plan.

D. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.

1. Use longest practical lengths.

E. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

H. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

I. Do not eccentrically load system or induce rotation of runners.

3.3 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

E. Cutting Acoustical Units:

1. Cut to fit irregular grid and perimeter edge trim.

2. Make field cut edges of same profile as factory edges.

F. Where round obstructions occur, provide preformed closures to match perimeter molding.

3.4 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.5 CLEANING

A. Clean surfaces.

B. Replace damaged or abraded components.

END OF SECTION

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SECTION 09 9123
INTERIOR PAINTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish new wall, new door and frame, and other surfaces as indicated.

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. Concealed pipes, ducts, and conduits.
7. Sprinkler heads.

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 2019.

C. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association Current Edition.

D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual Current Edition.

E. SSPC-SP 1 - Solvent Cleaning 2015, with Editorial Revision (2016).

F. SSPC-SP 6 - Commercial Blast Cleaning 2007.

1.4 SUBMITTALS

A. See Section 01 3300 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(s) product is to be used in; 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. 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 Temperatures for Paints: 50 degrees F (10 degrees C) for interiors unless required otherwise by manufacturer's instructions.

E. Provide lighting level of 80 ft candles (860 lx) 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. Diamond Vogel Paints: www.diamondvogel.com/#sle.
2. PPG Paints: www.ppgpaints.com/#sle.
3. Sherwin-Williams Company: www.sherwin-williams.com/#sle.
4. Architect pre-approved equivalent.

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 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:

1. Selection to be made by Architect/Engineer after award of contract.

2.3 PAINT SYSTEMS - INTERIOR

A. Paint I-OP - Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, uncoated steel, shop primed steel, and galvanized steel.

1. Paint hollow metal doors and door frames in all spaces indicated to receive new finishes.
2. Two top coats and one coat primer.
3. Top Coat(s): High Performance Architectural Interior Latex; MPI #138, 139, 140, or 141.
   a. Products:
      1) Sherwin-Williams Pre-Catalyzed Waterbased Epoxy, Eg-Shel. (MPI #139)
      2) Sherwin-Williams Pre-Catalyzed Waterbased Epoxy, Semi-Gloss. (MPI #141)
      3) Architect pre-approved equivalent.
4. Top Coat Sheen:
   a. Eggshell: MPI gloss level 3; use this sheen at gypsum wallboard locations.

b. Semi-Gloss: MPI gloss level 5; use this sheen for hollow metal doors and frames.

5. Primer: As recommended by top coat manufacturer for specific substrate.

2.4 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been adequately prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.

D. If substrate preparation is the responsibility of another installer, notify Architect/Engineer of unsatisfactory preparation before proceeding.

E. Test shop-applied primer for compatibility with subsequent cover materials.

F. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:

1. Gypsum Wallboard: 12 percent.

3.2 PREPARATION

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

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or repair existing paints or finishes that exhibit surface defects.

D. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

E. Seal surfaces that might cause bleed through or staining of topcoat.

F. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

G. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

H. Galvanized Surfaces:

1. Remove surface contamination and oils and wash with solvent according to SSPC-SP 1.

I. 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 using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

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. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

E. 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. Touch-up damaged finishes after Substantial Completion.

END OF SECTION

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SECTION 14 2000
ELEVATOR REPAIR SCOPE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Elevator modifications to connect fire recall to two (2) hydraulic elevators located on the campus of The Woodward Resource Center, Woodward, IA. The Consultant retained has acquired wiring diagrams sufficient to aid in adding Phase I Recall operation to the elevators located in Linden Court.

B. During the upgrade of the building fire suppression system, the intent is to connect the existing control system to take advantage of Phase One fire recall that is present in the elevator functions.

1.2 LINDEN COURT ELEVATORS ID# 3277 AND 3278

Elevator Type	In-Ground Hydraulic
Operation	Selective Collective
Landings Served	B, 1 & 2
Control Type	1980 ESI
Fire Service Type	ANSI A17.1 1978

A. The Linden Court elevators were designed with Fire recall operations under ANSI A17.1 1978 requirements. There is a Phase One switch located at the main landing that when activated, recalls the elevator.

1.3 SCOPE OF WORK FOR EACH ELEVATOR:

A. Install a new FEO-K1 fire recall switch and bezel in the hall station. The bezel shall be Red with the following markings:

1. Bypass, Off, On.
2. The key shall be removeable in the off and on positions only.

B. Connect the relay signals (provided by others) to the controller to enable recall by the fire detection system.

C. Install fire signage at all landings. The signage made of white plastic with red and black symbols containing three (3) flame emblems and “In Case of Fire Emergency Use Exit Stairs”

D. The signage at the Phase One switch shall include instructions for Phase One On, Off and Bypass positions.

E. There shall be a pretest prior to scheduling the acceptance test with the State of Iowa Elevator Division.

F. Provide all necessary materials, labor and permits.

1.4 SUBMITTALS

A. Pre-Construction

1. Product data: Provide a drawing of the proposed signal fixture to be installed at the main landings.

B. Post-Construction

1. Wiring Diagrams - Complete electrical circuit diagrams for control and operational features as installed, showing location and wiring for power, signal and control systems. The diagrams shall differentiate clearly between manufacturer-installed wiring and field installed wiring.

C. On-Site Wiring Diagrams: Provide job-specific wiring diagrams located near the elevator controller in the elevator control room. Provide one (1) hard copy sized at 11″ x 17″ minimum, clear-laminated wiring diagrams for each elevator.

D. Keys: Provide a total of three (3) sets of keys for each type of key fixture on the elevator equipment. Keys shall be tagged with permanent marking, identifying function and use.

1.5 ELECTRIC WIRING

A. Conductors: Copper throughout with individual wires coded and all connections on identified studs or terminal blocks. Use no splices or similar connections on any wiring except at terminal blocks, control cabinets, junction boxes or conduits.

B. Conduit: Painted or galvanized steel or aluminum conduit and duct shall be used. Conduit size shall be ¾-inch minimum, except that ½-inch can be used for runs containing only 2 wires. Flexible conduit exceeding 18 inches in length shall not be used. Flexible heavy duty service cord, type SO, may be used between fixed car wiring and car door switches for safety edges.

1.6 QUALITY ASSURANCE

A. All products installed by the successful contractor shall be in accordance with the codes enforced by the State of Iowa. All penetrations shall be patched and fire-stopped prior to inspection and handover.

1.7 WARRANTY

A. Provide a One (1) year warranty of all labor and materials installed under this section.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 21 1313
FIRE SUPPRESSION SPRINKLER SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Manufacturers
B. Pipes
C. Pipe Fittings
D. Joining Materials
E. General-Duty Valves
F. Fire Protection Service Valves
G. Specialty Valves
H. Sprinklers
I. Specialty Sprinkler Fittings
J. Alarm Devices
K. Pressure Gauges

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 sprinkler system's hydraulic design criteria shall be indicated on the Drawings.

B. The Contractor shall coordinate with the Woodward Resource Center 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. Water Flow Indicators and Supervisory Switches
    a. Potter Electric Signal Co.
    b. Honeywell.
    c. Engineer Pre-Approved Equivalent
2. Sprinklers
    a. Reliable Automatic Sprinkler Co., Inc.
    b. Tyco Fire Products, LP.
    c. Victaulic Company of America
    d. Viking Corp.
    e. Engineer Pre-Approved Equivalent
3. Fire Protection Service Gate and Check Valves
    a. Kennedy Valve Div., McWane, Inc.
    b. Nibco, Inc.
    c. Victaulic Company of America

d. Engineer Pre-Approved Equivalent

4. Flexible Sprinklers:
   a. Reliable Rascoflex
   b. Victaulic VicFlex
   c. Viking SprinkFlex
   d. Engineer Pre-Approved Equivalent
5. Grooved Couplings for Steel Piping
   a. Tyco Fire Products, LP.
   b. Victaulic Company of America
   c. Engineer Pre-Approved Equivalent

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 GENERAL DUTY VALVES

A. General

1. Materials: Discs, gaskets, packings, seats, diaphragms and lubricants shall conform to recommendations of the valve manufacturer for the intended use.
2. Body materials, unless otherwise stated:
    a. Bronze: 125-150 lbs., ASTM B62
    b. Iron: 200-300 lbs., ASTM B61
    c. Cast Iron: ASTM A126, Class B
    d. Cast Iron: ASTM 448
    e. Ductile Iron: ASTM A395
    f. Cast Steel: ASTM A216

B. Gate Valves
1. Provide gate valves complying with MSS SP-80. Gate valves shall be as follows unless otherwise indicated on the drawings.
    a. 2 in. and Smaller: 125-lb. saturated steam, screwed, solid wedge disc, and all parts ASTM B62 grade bronze except wheel and packing.
    b. 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.
2. Equip valves with packing suitable for intended service.
3. 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.

C. Ball valves
1. 2 in. and smaller: ASTM B584 bronze body, 2-piece, full port stainless steel ball, screwed or soldered ends with teflon seats and seals, blow out proof stem, tee or lever handle rated to 150 SWP/600W06.
2. Over 2in.: Carbon semi-steel or ductile iron body, 2-piece, full port stainless steel ball, ANSI rated flanged ends with teflon seats and lever handle.

D. Fire protection service valves
1. General: UL-listed and FM-approved, with 175-psig non-shock minimum working pressure rating.
    a. Option: Valves for use with grooved piping may be grooved type.

2.6 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. Sidewall; quick response, recessed type chrome-plated, two piece escutcheon ring, Reliable model F1FR series or approved equivalent.
3. 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.

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.

2.7 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.

2.8 ALARM DEVICES

A. Alarm Devices: Types and sizes that will match piping and equipment connections.

B. Waterflow Indicators: UL 346, electrical-supervision type, vane-type Waterflow detector, rated to 250 psig, and designed for horizontal or vertical installation. Include 2 SPDT (single-pole, double-throw) circuit switches to provide isolated alarm and auxiliary contacts, 7 ampere, 125 volts AC and 0.25 ampere, 24 volts DC; complete with factory-set, field-adjustable retard element to prevent false signals, and tamper-proof cover that sends a signal when cover is removed.

C. Supervisory Switches: UL 753 for valves, electrical-supervision type, SPDT (single-pole, double-throw), normally closed contacts, designed to signal controlled valve in other than full open position.

D. Supervisory Switches: UL 753 for indicator posts, electrical-supervision type, SPDT (single-pole, double-throw), normally closed contacts, designed to signal controlled valve in other than full open position.

2.9 PRESSURE GAUGES

A. Pressure Gauges: UL 393, 3-1/2" to 4-1/2" diameter dial, with dial range of 0-250 psig.

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. 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.

C. 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 VALVE APPLICATIONS

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shut-off Duty: Use gate, ball, or butterfly valves.

3.3 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.

3.4 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.

3.5 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.

3.6 VALVE INSTALLATIONS

A. General Duty Valves: Follow the manufacturer's recommended installation instructions concerning 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.

7. Install valves so piping does not place a stress or strain on the valve body.

8. Install extended-stem valves where insulation is indicated. Stems shall be extended such that the handle moves freely without 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 manufacturers recommendations.

B. Install fire-protection specialty valves, trim, fittings, controls, and specialties according to NFPA 13, manufacturer's written instructions, and the authority having jurisdiction.

C. Gate Valves: Install fire-protection service valves supervised-open, located to control sources of water supply excerpt from fire department connections. Where there is more than 1 control valve, provide permanently marked identification signs indicating portion of system controlled by each valve.

D. Install tamper switches on valves controlling water supply to the sprinkler system.

E. Install check valve in each water supply connection. Install backflow preventers instead of check valves in potable water supply sources.

F. Install valve on each sprinkler line to sprinkler head in elevator hoistway or elevator equipment room. Valve shall be located outside of these areas. Valves shall be locked in the open position.

G. Install permanent signs supported by chains identifying all drains, test connections, and water supply valves. Install placards indicating all hydraulic design criteria for each area and permanently attach placards to riser.

3.7 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, under overhead doors, and on non-recessed heads within 84 inches of the floor.

3.8 CONNECTIONS

A. Connect to fire department connections and accessories.

B. Connect water supplies to sprinkler systems. Include backflow preventers.

C. Electrical Connections: Power wiring as specified in Division 26 and 28.

D. Follow NFPA 24 testing requirements of below ground piping prior to connecting to the above ground pipes.

3.9 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.

3.10 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.

3.11 COMMISSIONING

A. Starting Procedures: Follow manufacturer's written procedures. If manufacturer prescribes no procedures, proceed as follows:

1. Verify that valves, trim, fittings, controls, and accessories have been installed correctly and operate correctly.
2. Verify that specified tests of pipng are complete.
3. Check that damaged sprinklers and sprinklers with paint or coating not specified have been replaced with new, correct type of sprinklers.
4. Check that sprinklers are correct type, have correct finish and temperature ratings, and have guards where required for applications.
5. Check that potable water supplies have correct type of backflow preventer.
6. Check that fire department connections have threads compatible with local fire department equipment and have correct pressure rating.
7. Fill wet pipe sprinkler systems with water.
8. Fill dry pipe sprinkler systems with air.
9. Energize circuits to electrical equipment and devices.
10. Adjust operating controls and pressure settings.

B. Coordinate with fire alarm system tests. Operate systems as required.

3.12 DEMONSTRATION

A. Demonstrate equipment, specialties, and accessories. Review operating and maintenance information.

B. Schedule demonstration with at least 7 days advance notice.

END OF SECTION

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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):

1. ASHRAE/IES 90.1 - 2010 Code for Energy Efficiency
2. ANSI Pressure Piping Standards (B31)

3. ASHRAE Safety Code for Mechanical Refrigeration (ANSI B9.1)
4. AWWA Standards
5. ASME Boiler and Pressure Vessel Code and State Boiler Code
6. American Gas Association
7. AWS Standards for Welding
8. National Electrical Code
9. Local and/or State Plumbing, Mechanical and Building Codes
10. Occupational Safety and Health Act (OSHA)
11. International Energy Conservation Code 2012
12. Uniform Plumbing Code
13. International Mechanical Code
14. NFPA Standards and Pamphlets

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 project documents 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.

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 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 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. Coordinate the placing of openings in the new structure, as required for the installation of the mechanical work.

B. Furnish 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 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.

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 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.

3.11 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.

3.12 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.

3.13 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.

3.14 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. Pumps
3. Unit Heaters

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 and include shaft grounding kits. 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:

1. ANSI B31.1: Power Piping

B. 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.

B. Dielectric Barriers: Provide between metallic supports and metallic piping and associated items of dissimilar type; acceptable dielectric barriers include rubber or plastic sheets or coatings attached securely to pipe or item.

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"

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"
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"

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 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 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, Brimar or Engineer pre-approved equivalent.

1.3 SUBMITTALS

A. Submit manufacturer's product data.

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 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 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 DAMPER TAG FASTENERS

A. Manufacturer's standard solid brass chain or solid brass S-hooks of sizes required for proper attachment of tags to dampers, and manufactured specifically for that purpose.

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.

3.2 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. Refrigerant (suction and liquid)
2. Pumped condensate.
3. Natural Gas

B. Equipment/Ductwork

1. Air Handling Units
2. Air separator.
3. Unit Heaters.
4. Furnaces.
5. Air Cooled Condensing Units.
6. Exhaust fans.
7. Ductwork (Supply, Return, Exhaust, Outdoor Air)
8. 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.

END OF SECTION

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SECTION 23 0593
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.1 SUMMARY

A. Testing, adjustment, and balancing of air systems.

B. Measurement of final operating condition of HVAC systems.

C. Commissioning – see Commissioning specifications. This contractor shall assist in the commissioning of the systems specified.

1.2 QUALIFICATIONS

A. Testing and balancing shall be performed by an independent certified testing and balancing contractor. The Contractor shall be certified by the AABC (American Association of Balancing Contractors) or NEBB (National Environmental Balancing Bureau). The Balancing Contractor shall provide labor, services, and test equipment required to test, adjust, and balance the specified systems. Personnel involved in the execution of the work under the Balancing Contract shall be experienced and trained in the total balancing of mechanical systems, as well as being regular employees of the Balancing Contractor.

1.3 SUBMITTALS

A. Submit under provisions of Division 01.

B. Submit name of adjusting and balancing agency for approval within 30 days after award of Contract.

C. Field Reports: Submit under provisions of Division 01.

D. Field Reports: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.

E. Prior to commencing work, submit report forms or outline indicating adjusting, balancing, and equipment data required.

F. 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.

G. Provide report in PDF, Excel, or Word format, complete with cover page.

H. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.

I. Test Reports: Indicate data on forms containing information indicated in Schedules.

1.4 SEQUENCING

A. Sequence work to commence after completion of systems installation and schedule completion of balancing work before Substantial Completion of Project.

B. Do not proceed with balancing work until systems scheduled for testing, adjusting, and balancing are clean and free from debris, dirt, and discarded building materials.

C. Complete all testing and balancing before start of commissioning functional performance tests.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 OTHER CONTRACTOR RESPONSIBILITIES

A. The Mechanical Contractors shall cooperate with the balancing agency by:

1. Putting complete system into operation during duration of balancing period.
2. Providing up-to-date set of Drawings and advising immediately of changes made to the system during construction.
3. Providing labor and equipment and cost of performing corrections such as dampers, belts, and pulley changes, etc. as required without undue delay.
4. 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.

B. Submit field reports. Report defects and deficiencies noted during performance of services which prevent system balance.

C. Beginning of work means acceptance of existing conditions.

3.3 PREPARATION

A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect/Engineer to facilitate spot checks during testing.

B. Provide additional balancing devices as required.

3.4 INSTALLATION TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 of design for return and exhaust systems.

B. Diffusers, Registers and Grilles: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust diffusers, registers and grilles in space to within plus or minus 10 percent of design.

3.5 ADJUSTING

A. Ensure recorded data represents actual measured or observed conditions.

B. Permanently mark settings of dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostat to specified settings.

3.6 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design exhaust air quantities at site altitude.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices to regulate air quantities only to the extent that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

F. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowance for 50 percent loading of filters.

G. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

H. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

I. Where modulating dampers are provided, take measurements and balance at extreme conditions.

3.7 SCHEDULES

A. Equipment Requiring Testing, Adjusting, and Balancing

1. Forced Air Furnaces
2. Air Handling Units
3. Exhaust Fans

4. Unit Heaters
5. Variable Air Volume Units
6. Diffusers, Registers and Grilles

B. OUTDOOR AIR VENTILATION DATA

1. Air Handling Units shall be tested and balanced for the following conditions:
   a. Capacity as scheduled on the drawings
2. Coordinate testing with the temperature controls contractor and identify the % actuator stroke correlating with the above capacities.
3. Submit this in report form to the engineer prior to submitting final report.

3.8 REPORT FORMS

A. Title Page:

1. Name of Testing, Adjusting, and Balancing Agency
2. Address of Testing, Adjusting, and Balancing Agency
3. Telephone number of Testing, Adjusting, and Balancing Agency
4. Project name
5. Project location
6. Project Architect
7. Project Engineer
8. Project Contractor
9. Project altitude
10. Report date

B. Summary Comments:

1. Design versus final performance
2. Notable characteristics of system
3. Description of systems operation sequence
4. Summary of outdoor and exhaust flows to indicate amount of building pressurization
5. Nomenclature used throughout report
6. Test conditions

C. Instrument List:

1. Instrument
2. Manufacturer
3. Model number
4. Serial number
5. Range
6. Calibration date

D. Electric Motors:

1. Manufacturer
2. Model/Frame
3. HP/BHP.
4. Phase, voltage, amperage; nameplate, actual, no load
5. RPM
6. Service factor
7. Starter size, rating, heater elements
8. Sheave Make/Size/Bore

E. Electric Duct Heater:

1. Manufacturer
2. Identification/number
3. Location
4. Model number
5. Design kW
6. Number of stages
7. Phase, voltage, amperage
8. Test voltage (each phase)
9. Test amperage (each phase)
10. Air flow, specified and actual
11. Temperature rise, specified and actual
12. Static pressure required for air flow switch

F. Return Air/Outside Air Data:

1. Identification/location
2. Design air flow
3. Actual air flow
4. Design return air flow
5. Actual return air flow
6. Design outside air flow
7. Actual outside air flow
8. Return air temperature
9. Outside air temperature
10. Required mixed air temperature
11. Actual mixed air temperature
12. Design outside/return air ratio
13. Actual outside/return air ratio

G. Exhaust Fan Data:

1. Location
2. Manufacturer
3. Model number
4. Serial number
5. Air flow, specified and actual
6. Total static pressure (total external), specified and actual
7. Inlet pressure
8. Discharge pressure
9. Sheave Make/Size/Bore
10. Number of Belts/Make/Size
11. Fan RPM
12. Fan BHP

H. Air Monitoring Station Data:

1. Identification/location
2. System
3. Size
4. Area
5. Design velocity
6. Design air flow
7. Test velocity
8. Test air flow

I. Variable Air Volume Units (VAV Box) Data:

1. Manufacturer
2. Type, constant, variable, single, dual duct
3. Identification/number
4. Location
5. Model number
6. Size
7. Minimum static pressure
8. Minimum design air flow
9. Maximum design air flow
10. Maximum actual air flow
11. Inlet static pressure

J. Unit Heaters, Fin-Tube, etc:

1. Unit type, manufacturer, model no., etc.
2. Entering and leaving air temperature

3. Electrical data

K. Air Distribution Test Sheet (Diffusers, Registers and Grilles):

1. Air terminal number
2. Room number/location
3. Terminal type
4. Terminal size
5. Area factor
6. Design velocity
7. Design air flow
8. Test (final) velocity
9. Test (final) air flow
10. Percent of design air flow

END OF SECTION

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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 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.
2. 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 pre-approved equivalent.
3. Type IA: Fiberglass duct wrap, 0.75 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 0.29 BTU-in/hr-ft2-°F @ 75° F mean temperature. Water vapor permeance of 0.02 perms. Knauf Duct Wrap or Engineer pre-approved equivalent.

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 300" or Engineer pre-approved equivalent.

B. 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 300" or Engineer pre-approved equivalent.

C. 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

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. Insulation Jackets shall be provided in mechanical spaces or exposed in any other occupied spaces. Colors shall be white.
2. 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. Wherever piping penetrates a floor or is exposed in a finished area, 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 PIPE INSULATION SCHEDULE (BASED ON 2012 IECC)

SERVICE	TEMP (°F)	TYPE	NOMINAL PIPE SIZE (INCHES)				
			<1	1 TO <1-1/2	1-1/2 TO <4	4 TO <8	8+
Refigerant Suction, Refrigerant Liquid		B	1"	1"	1"	1"	1 1/2"

3.6 MINIMUM DUCT INSULATION SCHEDULE (BASED ON 2012 IECC)

SERVICE	TYPE	THICKNESS
Supply Air Ducts	I	2"
Return Ducts	I	2"
Outdoor Air Intake	IA	3"
Exterior Ducts - See Section 23 3113		

END OF SECTION

SECTION 23 0800
MECHANICAL COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section. These requirements shall be in addition to applicable Division 23, 26, 27, and 28 Sections.

B. OPR and BOD, documentation prepared by the Owner's Design Professionals contains requirements that apply to this Section.

1.2 SUMMARY

A. This Section includes requirements for commissioning the HVAC system and its subsystems and equipment.

B. This Section describes the requirements for start-up and commissioning for Division 23 installed work, including but not limited to:

1. All systems and alarms connected to the Building Automation System (BAS)
2. Air handling unit coils
3. Variable frequency drives
4. Variable air volume boxes
5. Reheat coils
6. Ductwork
7. Piping
8. Direct digital control system performance or other control system type as applicable, for accuracy, conformance, and operational sequences.
9. Temperature controls
10. Testing and balancing
11. Unit heaters

1.3 COORDINATION

A. Coordinate commissioning requirements noted in other Division 23 Sections.

1.4 DEFINITIONS

A. Architect: Includes Architect identified in the Contract for Construction between Owner and Contractor, plus consultant/design professionals responsible for design of HVAC, electrical, communications, controls for HVAC systems, and other related systems.

B. BOD: Basis of Design.

C. CxA: Commissioning Authority.

D. OPR: Owner's Project Requirements.

E. Systems, Subsystems, and Equipment: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, and equipment.

F. TAB: Testing, Adjusting, and Balancing.

1.5 COMMISSIONING TEAM

A. Members Appointed by Contractor(s): Individuals, each having the authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated action. The commissioning team shall consist of, but not be limited to, representatives of the Construction Manager and each Contractor, including project superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxA.

B. Members Appointed by Owner:

1. CxA: The designated person, company, or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process. Owner will engage the CxA under a separate contract.
2. Representatives of the facility user and operation and maintenance personnel.
3. Architect and engineering design professionals.

1.6 OWNER'S RESPONSIBILITIES

A. Provide the OPR documentation to the CxA and each Contractor for information and use.

B. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities.

C. Provide the BOD documentation, prepared by Architect/Engineer and approved by Owner, to the CxA and each Contractor for use in developing the commissioning plan, systems manual, and operation and maintenance training plan.

1.7 CONTRACTOR'S RESPONSIBILITIES

A. The following responsibilities are components of the General Contractor scope identified in other related sections. This information is highlighted here for convenience and is not a list of additional services. The only exception to the responsibilities specified elsewhere is that the CxA must be present during these operations in order to comply with the commissioning specification.

1. Attend with responsible sub-contractors commissioning progress meetings and cooperate with CxA for resolution of issues related to commissioning.
2. Integrate and coordinate commissioning process activities with construction schedule.
3. Review and authorize responsible sub-contractors to complete Pre-Functional and Functional Performance Testing (FPT) checklists provided by the CxA.
4. Authorize sub-contractors to make available technicians and/or coordinate with the manufacturer's authorized technicians to startup HVAC systems, assemblies, and equipment and simulate conditions for the purpose of completing Functional Performance Testing.
5. Attend with responsible sub-contractors testing, adjusting, and balancing review and coordination meeting.

6. Participate with responsible sub-contractors in HVAC systems, assemblies, equipment, and component maintenance orientation and inspection as directed by the CxA.
7. Provide equipment operational and maintenance and related information requested by the CxA for final commissioning documentation.
8. Certify that TAB work is complete.

B. Mechanical Subcontractor:

1. Attend TAB verification testing.
2. Provide measuring instruments and logging devices to record test data, and data acquisition equipment to record data for the complete range of testing for the required test period.

C. HVAC Instrumentation and Control Subcontractor: With the CxA, review control designs for compliance with the OPR and BOD, controllability with respect to actual equipment to be installed, and recommend adjustments to control designs and sequence of operation descriptions.

D. Testing and Balancing Subcontractor:

1. Contract Documents Review: With the CxA, review the Contract Documents before developing TAB procedures.
    a. Verify the following:
        1) Accessibility of equipment and components required for TAB work.
        2) Adequate number and placement of duct balancing dampers to allow proper balancing while minimizing sound levels in occupied spaces.
        3) Adequate number and placement of balancing valves to allow proper balancing and recording of water flow.
        4) Adequate number and placement of test ports and test instrumentation to allow reading and compilation of system and equipment performance data needed to conduct both TAB and commissioning testing.
        5) Air and water flow rates have been specified and compared to central equipment output capacities.
        6) Identify discontinuities and omissions in the Contract Documents.
        7) This review of the Contract Documents by the TAB Subcontractor satisfies requirements for a design review report as specified in Division 23, Section 23 0593, Testing, Adjusting, and Balancing.
    b. Additional Responsibilities: Participate in tests specified in Division 23, Section 23 0900 “Instrumentation and Control for HVAC".

E. Electrical Subcontractor:

1. With the Mechanical Subcontractor, coordinate installations and connections between and among electrical and HVAC systems, subsystems, and equipment.
2. Attend TAB verification testing.

1.8 CXA'S RESPONSIBILITIES

A. Provide commissioning specification to be incorporated into Contract Documents.

B. Provide Commissioning Plan for process and schedule for completing Pre-Functional checklists, manufacturer's pre-start and startup checklists for HVACR systems, assemblies, equipment, and components to be verified and tested, and Functional Performance Testing checklists.

C. Evaluate Contract Documents (plans and specifications) prior to bidding only as the contract documents relate to the OPR and BOD documents and Commissioning Process requirements specified elsewhere. The CxA's evaluation constitutes no responsibility over design concept, design criteria or compliance with codes. The CxA does not verify calculations, proof schematics or layouts in detail, or provide an in depth constructability review.

D. Provide Pre-Functional and Functional Performance Testing commissioning forms for the contractor to complete as work progresses.

E. Witness startup and simulation of conditions for equipment specified in this section. Contractor is responsible for start-up.

F. Verify that testing, adjusting, and balancing of work is completed as required by the Contract Documents and perform limited verification of testing, adjusting, and balancing report data.

G. Provide test data, inspection reports, and certificates in Systems Manual.

1.9 COMMISSIONING DOCUMENTATION

A. Test Checklists: CxA shall develop test checklists for HVAC systems, subsystems, and equipment, including interfaces and interlocks with other systems. In addition to the requirements specified in Division 01 Section 01 9100 "Building Systems General Commissioning Requirements," checklists shall include, but not be limited to, the following:

1. Calibration of sensors and sensor function.
2. Testing conditions under which test was conducted, including (as applicable) ambient conditions, set points, override conditions, and status and operating conditions that impact the results of test.
3. Control sequences for HVAC systems.
4. Responses to control signals at specified conditions.
5. Sequence of response(s) to control signals at specified conditions.
6. Narrative description of observed performance of systems, subsystems, and equipment. Notation to indicate whether the observed performance at each step meets the expected results.
7. Interaction of auxiliary equipment.
8. Deficiency log.

B. Contractors shall provide the following information to the CxA for inclusion in the Commissioning Process Final Report:

1. Copy of contractor's 'as-built' drawings indicating changes that occurred during the construction phase. The original as-built drawings are processed in accordance with requirements specified elsewhere.
2. Copies of plan and documentation requirements for start-up and initial checkout.
3. Copies of completed pre-functional and functional performance testing checklists.
4. Copies of commissioning corrective action report.

1.10 SUBMITTALS

A. The following submittals are in addition to those specified in Section 01 9100, General Commissioning Requirements.

B. Certificate of Readiness: MEPxA will compile certificates of readiness from the Contractor certifying that systems, subsystems, equipment, and associated controls are ready for testing.

C. Certified Pipe Cleaning and Flushing Report: CxA will collect and document that pipe cleaning; flushing, hydrostatic testing, and chemical treating have been completed.

D. Test and Inspection Reports: CxA will compile and submit test reports and certificates, and shall include them in systems manual and commissioning report.

E. Corrective Action Documents: CxA will maintain and submit corrective action documents.

F. Certified TAB Reports: CxA will submit verified, certified TAB reports.

G. Certificates of Completion of installation, pre-start, and start-up activities.

PART2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 TESTING PREPARATION

A. Prerequisites for Testing:

1. Certify that HVAC systems, subsystems, and equipment have been completed, calibrated, and started; are operating according to the OPR, BOD, and Contract Documents; and that Certificates of Readiness are signed and submitted.
2. Certify that HVAC instrumentation and control systems have been completed and calibrated; are operating according to the OPR, BOD, and Contract Documents; and that pre-test set points have been recorded.
3. Certify that TAB procedures have been completed, and that TAB reports have been submitted, discrepancies corrected, and corrective work approved.
4. Test systems and intersystem performance after approval of test checklists for systems, subsystems, and equipment.
5. Set systems, subsystems, and equipment into operating mode to be tested (e.g., normal shut down, normal auto position, normal manual position, unoccupied cycle, emergency power, and alarm conditions).
6. Verify each operating cycle after it has been running for a specified period and is operating in a steady-state condition.
7. Inspect and verify the position of each device and interlock identified on checklists. Sign off each item as acceptable, or failed. Repeat this test for each operating cycle that applies to system being tested.
8. Check safety cutouts, alarms, and interlocks with smoke control and life-safety systems during each mode of operation.
9. Annotate checklist or data sheet when a deficiency is observed.

10. Verify equipment interface with monitoring and control system and TAB criteria; include the following:
    a. Supply and return flow rates for VAV and constant volume systems in each operational mode.
    b. Operation of terminal units in both heating and cooling cycles.
    c. Minimum outdoor-air intake in each operational mode and at minimum and maximum airflows.
    d. Building pressurization.
    e. Total exhaust airflow and total outdoor-air intake.
    f. Operation of indoor-air-quality monitoring systems.
    g. Verify proper responses of monitoring and control system controllers and sensors to include the following:
        1) For each controller or sensor, record the indicated monitoring and control system reading and the test instrument reading. If initial test indicates that the test reading is outside of the control range of the installed device, check calibration of the installed device and adjust as required. Retest malfunctioning devices and record results on checklist or data sheet.
        2) Report deficiencies and prepare an issues log entry.
    h. Verify that HVAC equipment field quality-control testing has been completed and approved. CxA shall direct, witness, and document field quality-control tests, inspections, and startup specified in individual Division 23 Sections.

B. Testing Instrumentation: Install measuring instruments and logging devices to record test data for the required test period. Instrumentation shall monitor and record full range of operating conditions and shall allow for calculation of total capacity of system for each mode of operation. Operational modes include the following:
    1. Occupied and unoccupied.
    2. Warm up and cool down.
    3. Economizer cycle.
    4. Life-safety and safety systems.
    5. Fire safety.

3.2 TESTING

A. Test systems and intersystem performance after test checklists for systems, subsystems, and equipment have been approved.

B. Perform tests using design conditions whenever possible.
    1. Simulate conditions by imposing an artificial load when it is not practical to test under design conditions and when written approval for simulated conditions is received from CxA. Before simulating conditions, calibrate testing instruments. Set and document simulated conditions and methods of simulation. After tests, return settings to normal operating conditions.

2. Alter set points when simulating conditions is not practical and when written approval is received from CxA.
3. Alter sensor values with a signal generator when design or simulating conditions and altering set points are not practical. Do not use sensor to act as signal generator to simulate conditions or override values.

C. Scope of HVAC Subcontractor Testing:

1. Testing scope shall include entire HVAC installation, from central equipment for heat generation and refrigeration through distribution systems to each conditioned space. It shall include measuring capacities and effectiveness of operational and control functions.
2. Test all operating modes, interlocks, control responses, responses to abnormal or emergency conditions, and verify proper response of building automation system controllers and sensors.

D. Detailed Testing Procedures: CxA, with HVAC Subcontractor, TAB Subcontractor, MEP Engineer of Record and HVAC Instrumentation and Control Subcontractor, shall prepare detailed testing plans, procedures, and checklists for HVAC systems, subsystems, and equipment.

E. HVAC Instrumentation and Control System Testing:

1. Field testing plans and testing requirements are specified in Division 23 Sections 23 0923 "Direct-Digital Control Systems for HVAC". The CxA, HVAC Subcontractor, and the HVAC Instrumentation and Control Subcontractor shall collaborate to prepare testing plans.

F. Pipe cleaning, flushing, hydrostatic tests, and chemical treatment requirements are specified in Division 23 piping sections. HVAC Subcontractor shall prepare pipe system cleaning, flushing, and hydrostatic testing plan. CxA shall review and comment on plan and final reports. CxA shall certify that pipe cleaning, flushing, hydrostatic tests, and chemical treatment have been completed. Plan shall include the following:

1. Sequence of testing and testing procedures for each section of pipe to be tested, identified by pipe zone or sector identification marker. Markers shall be keyed Drawings for each pipe sector showing the physical location of each designated pipe test section. Drawings keyed to pipe zones or sectors shall be formatted to allow each section of piping to be physically located and identified when referred to in pipe system cleaning, flushing, hydrostatic testing, and chemical treatment plan.
2. Description of equipment for flushing operations.
3. Minimum flushing water velocity.
4. Tracking checklist for managing and ensuring that all pipe sections have been cleaned, flushed, hydrostatically tested, and chemically treated.

G. Deferred Testing:

1. If tests cannot be completed because of a deficiency outside the scope of the HVAC system, the deficiency shall be documented and reported to the Construction Manager or CxA. Deficiencies shall be resolved and corrected by appropriate parties and test rescheduled.
2. If the testing plan indicates specific seasonal testing, appropriate initial performance tests shall be completed and documented and additional tests scheduled.

H. Testing Reports:

1. Reports shall include measured data, data sheets, and a comprehensive summary describing the operation of systems at the time of testing.
2. Include data sheets for each controller to verify proper operation of the control system, the system it serves, the service it provides, and its location. For each controller, provide space for recording its readout, the reading at the controller's sensor(s), plus comments. Provide space for testing personnel to sign off on each data sheet.
3. Prepare a preliminary test report. Deficiencies will be evaluated by Architect/Engineer to determine corrective action. Deficiencies shall be corrected and test repeated.
4. If it is determined that the system is constructed according to the Contract Documents, Owner will decide whether modifications required to bring the performance of the system to the OPR and BOD documents shall be implemented or if tests will be accepted as submitted. If corrective work is performed, Owner will decide if tests shall be repeated and a revised report submitted.

END OF SECTION

SECTION 23 0923
DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC

PART 1 GENERAL

1.1 SECTION INCLUDES

A. System description.

B. Operator interface.

C. Controllers.

D. Power supplies and line filtering.

E. Auxiliary control devices.

F. Sensors and devices.

G. Wiring and raceways.

H. Refer to Drawings for control diagrams, control points, and control sequences.

1.2 DESCRIPTION

A. General: The control system shall consist of a high-speed, peer-to-peer network of DDC controllers, a control system server, and a web-based operator interface.

1. The DDC system components shall be BACnet BTL certified, utilizing an operator workstation at the LAN (local IP at building) level; this LAN shall be sufficient to operate this building's systems as stand alone.

2. All components on IP subnets (field busses) shall support MS/TP architecture, with full functionality and communication both with and without the building controller.

3. Each controller shall be capable of full and complete standalone operation of respective unit.

4. The system shall be an extension of the existing Metasys system by Johnson Controls.

B. System shall use the BACnet protocol for communication to the operator workstation or web server and for communication between control modules. I/O points, schedules, setpoints, trends and alarms as specified on the drawings.

C. Project Specific Description:

1. All hardware, equipment and material shall be completely installed two (2) weeks prior to Substantial Completion, to allow immediate start by the temperature controls contractor (TCC) as identified directly below.

D. Meetings:

1. The Owner, Engineer, Controls Contractor and Commissioning Authority (CxA) to hold a meeting to review the Controls Submittal.

2. A subsequent Programming Review meeting will be held to review the actual program and proactively address any concerns. If factory-controlled equipment is being used, a manufacturer's representative should be available with an accurate points list and sequence of operations specific for the piece of equipment being supplied. The person from the controls contractor who will be actually writing the programming will be required to attend this meeting.
3. At turnover/substantial completion, the Controls Contractor shall meet with the Owner and CxA for a demonstration to confirm that the systems are under control and programming is complete.

E. The control system shall accommodate simultaneous multiple user operation. Access to the control system data should be limited only by operator password. Multiple users shall have access to all valid system data. An operator shall be able to log onto any workstation on the control system and have access to all appropriate data.

F. The control system shall be designed such that each mechanical system will be able to operate under stand-alone control. As such, in the event of a network communication failure, or the loss of any other controller, the control system shall continue to independently operate under control.

G. The documentation is schematic in nature. The Contractor shall provide hardware and software necessary to implement the functions and sequences shown.

1.3 RELATED REQUIREMENTS

A. Section 26 0519 Low-Voltage Electrical Power Conductors and Cables

B. Section 28 3111 Digital, Addressable Fire-Alarm System

1.4 REFERENCES

A. MIL-STD-810 - Environmental Engineering Considerations and Laboratory Tests; 2019h, with Editorial Revision (2022).

B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

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

D. Input/output devices, specified or future, associated with the DDC control system shall be ASCII (American Standard Code for Information Interchange) coded with standard EIA (Electronic Industries Association) interface hardware.

E. Wiring performed by the DDC Contractor shall be installed in accordance with all applicable local, state, and national codes.

F. Instrumentation hardware shall be supplied to directly interface with Instrument Society of America (ISA) Standards.

G. Applicable sections of International Building Code (IBC) inlcude:

1. Fire Alarm and Detection Systems Section
2. Mechanical Section

1.5 SUBMITTALS

A. Submit the following within 30 days of contract award:

1. A complete bill of materials of equipment to be used indicating quantity, manufacturer, and model number.
2. A schedule of all control valves including the valve size, model number (including pattern and connections), flow, CV, pressure rating, and location.
3. Provide manufacturer's cut sheets for major system components. When manufacturer's cut sheets apply to a product series rather than a specific product, the data specifically applicable to the project shall be highlighted or clearly indicated by other means. Each submitted piece of literature and drawings shall clearly reference the specification and/or drawing that the submittal is being submitted to cover. Include:
    a. Building Controllers, Custom Application Controllers, and Application Specific Controllers
    b. Operator Interface Computer
    c. Auxiliary Control Devices
    d. Provide a sample graphic for each type of system being installed.

B. Contractor shall provide shop drawings and manufacturers' standard specification data sheets on all hardware and software to be provided. No work may begin on any segment of this project until submittals have been reviewed by the Engineer and Owner for conformity with the plan and specifications.

C. Product Data: Provide data for each system component and software module.
1. When manufacturer’s cut sheets apply to a product series rather than a specific product, the data specifically applicable to the project shall be highlighted or clearly indicated by other means.
2. Each submitted piece of literature and drawing shall clearly reference the specification and/or drawing that the submittal is to cover.
3. General catalogs shall not be accepted as cut sheets to fulfill submittal requirements.

D. Shop Drawings:
1. Proposed control system riser diagram showing system configuration, device locations, addresses, and cabling.
2. Detailed termination drawings showing all required field and factory terminations. Terminal numbers shall be clearly labeled.
3. List connected data points, including connected control unit, input device and the proposed English language object names
4. Indicate system graphics indicating monitored systems, data (connected and calculated) point addresses, and operator notations.
5. Show system configuration with peripheral devices, batteries, power supplies, diagrams, modems, and interconnections.
6. Sequence of operations for each system under control. This sequence shall be specific for the use of the Control System being provided for this project.
7. Sequences included in the submittal must reflect what will be programmed. Copied sequences will not be accepted.

E. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner s name and registered with manufacturer.

1.6 QUALITY ASSURANCE

A. Perform work in accordance with NFPA 70.

B. Designer Qualifications: Perform design of system using manufacturer's software under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

C. The installer shall have a service office within 100 miles of the project site and provide 24-hour response in the event of a customer call.

D. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for purpose specified and indicated.

E. The Contractor must be an authorized factory direct representative in good standing of the manufacturer of the proposed hardware and software components.

F. The Contractor shall technicians who have successfully completed the factory authorized training of the proposed manufactures hardware and software components and have successfully completed certification course(s).

G. All products used in this installation shall be new, currently under manufacture, and shall be applied in similar installations for a minimum of 2 years. This installation shall not be used as a test site for any new products unless explicitly approved by the Owner's representative in writing prior to bid date. Spare parts shall be available for at least 10 years after completion of this contract. List below only products, construction, and equipment that the reader might expect to find in this Section but are specified elsewhere.

1.7 WORK BY OTHERS

A. The following incidental work shall be furnished by the Mechanical Contractor under the supervision of this Contractor.

1. Furnish and install all necessary valves, pressure taps, flow meters, water, drain and overflow connections and piping.

2. Furnish and install all necessary piping connections required for flow devices, valve position indicators, etc.

3. Install all automatic dampers.

1.8 WARRANTY

A. Warrant labor and materials for specified control system free from defects for a period of 12 months after substantial completion. Control system failures during warranty period shall be adjusted, repaired, or replaced at no additional cost or reduction in service to Owner. Respond during normal business hours within 24 hours of Owner’s warranty service request.

B. Work shall have a single warranty date, even if Owner receives beneficial use due to early system start-up. If specified work is split into multiple contracts or a multi-phase contract, each contract or phase shall have a separate warranty start date and period.

C. If the engineer determines that equipment and systems operate satisfactorily at the end of final start-up, testing, and commissioning phase, the engineer will certify in writing that control system operation has been tested and accepted in accordance with the terms of this specification. Date of substantial completion shall begin warranty period.

D. Provide updates to operator workstation or web server software, project-specific software, graphic software, database software, and firmware that resolve the contractor-identified software deficiencies at no charge during warranty period. If available, Owner can purchase in-warranty service agreement to receive upgrades for functional enhancements associated with above-mentioned items. Do not install updates or upgrades without Owner's written authorization.

E. Exception: Contractor shall not be required to warrant reused devices except those that have been rebuilt or repaired. Installation labor and materials shall be warranted. Demonstrate operable condition of reused devices at time of Engineer's acceptance.

1.9 SYSTEM PERFORMANCE

A. Performance Standards. System shall conform to the following minimum standards over network connections. Systems shall be tested using manufacturer's recommended hardware and software for operator workstation (server and browser for web-based systems).

1. Graphic Display. A graphic with 20 dynamic points shall display with current data within 10 sec.
2. Graphic Refresh. A graphic with 20 dynamic points shall update with current data within 8 sec. and shall automatically refresh every 15 sec.
3. Configuration and Tuning Screens. Screens used for configuring, calibrating, or tuning points, PID loops, and similar control logic shall automatically refresh within 6 sec.
4. Object Command. Devices shall react to command of a binary object within 2 sec. Devices shall begin reacting to command of an analog object within 2 sec.
5. Alarm Response Time. An object that goes into alarm shall be annunciated at the workstation within 45 sec.
6. Program Execution Frequency. Custom and standard applications shall be capable of running as often as once every 5 sec. Select execution times consistent with the mechanical process under control.
7. Performance. Programmable controllers shall be able to completely execute DDC PID control loops at a frequency adjustable down to once per sec. Select execution times consistent with the mechanical process under control.
8. Multiple Alarm Annunciation. Each workstation on the network shall receive alarms within 5 sec of other workstations.
9. Reporting Accuracy. System shall report values with minimum end-to-end accuracy listed in Table 1.
10. Control Stability and Accuracy. Control loops shall maintain measured variable at setpoint within tolerances listed in Table 2.

B. Table 1: Reporting Accuracy

Measured Variable	Reported Accuracy
Space Temperature	±0.5ºC (±1ºF)
Outside Air	±1.0ºC (±2ºF)
Water Temperature	±0.5ºC (±1ºF)
Delta-T	±0.15º (±0.25ºF)
Water Flow	±2% of full scale
Water Pressure	±2% of full scale (see Note 2)

Measured Variable	Reported Accuracy
Electrical	±1% of reading (see Note 3)
Carbon Monoxide (CO)	±5% of reading
Carbon Dioxide (CO2)	±50 ppm

1. Note 1: Accuracy applies to 10%-100% of scale
2. Note 2: For both absolute and differential pressure
3. Note 3: Not including utility-supplied meters

C. Table 2: Control Stability and Accuracy

Controlled Variable	Control Accuracy	Range of Medium
Space Temperature	±1.0ºC (±2.0ºF)	
Fluid Pressure	±10 kPa (±1.5 psi) ±250 Pa (±1.0 in. w.g.)	MPa (1–150 psi) 0–12.5 kPa (0–50 in. w.g.) differential

1.10 PRODUCTS NOT FURNISHED/INSTALLED UNDER BUT INTEGRATED WITH THIS SECTION

A. Section - General

1. Coordination Meeting: The Installer furnishing the DDC network shall meet with the Installer(s) furnishing each of the following products to coordinate details of the interface between these products and the DDC network. The Owner or his designated representative shall be present at this meeting. Each Installer shall provide the Owner and all other Installers with details of the proposed interface including PICS for BACnet equipment, hardware and software identifiers for the interface points, network identifiers, wiring requirements, communication speeds, and required network accessories. The purpose of this meeting shall be to insure there are no unresolved issues regarding the integration of these products into the DDC network. Submittals for these products shall not be approved prior to the completion of this meeting.

B. Section 23 8000 series - Decentralized HVAC Equipment

1. Unit ventilators, unit heaters, fan coils, etc.: Unit ventilators, unit heaters, fan coils, cabinet heaters, convective or fin tube heaters, zone reheat, and similar terminal units: These units shall be furnished configured to accept control inputs from an external building automation system controller as specified on the drawings and equipment specifications. Factory mounted safeties and other controls shall not interfere with this controller.

1.11 DEFINITIONS

BACnet Interoperability Building Blocks (BIBB)	A BIBB defines a small portion of BACnet functionality that is needed to perform a particular task. BIBBS are combined to build the BACnet functional requirements for a device in a specification.
BACnet/BACnet Standard	BACnet communication requirements as defined by the latest version of ASHRAE/ANSI 135 and approved addenda.
Control Systems Server	A computer(s) that maintain(s) the systems configuration and programming database.

Controller	Intelligent stand-alone control device. Controller is a generic reference to building controllers, custom application controllers, and application specific controllers.
Direct Digital Control	Microprocessor-based control including Analog/Digital conversion and program logic.
Gateway	Bi-directional protocol translator connecting control systems that use different communication protocols.
Local Area Network	Computer or control system communications network limited to local building or campus.
Master-Slave/Token Passing	Data link protocol as defined by the BACnet standard.
Point-to-Point	Serial communication as defined in the BACnet standard.
Primary Controlling LAN	High speed, peer-to-peer controller LAN connecting BCs and optionally AACs and ASCs. Refer to System Architecture below.
Protocol Implementation Conformance Statement	A written document that identifies the particular options specified by BACnet that are implemented in a device.
Router	A device that connects two or more networks at the network layer.
Wiring	Raceway, fittings, wire, boxes and related items.

1.12 ABBREVIATIONS

A. The following abbreviations may be used in graphics, schematics, point names, and other applications where space is at a premium:

1. **AAC** – Advanced Application Controllers
2. **AC** - Air Conditioning
3. **ACU** - Air Conditioning Unit
4. **AHU** - Air Handling Unit
5. **AI** - Analog Input
6. **AO** - Analog Output
7. **ASC** – Application Specific Controllers
8. **AUTO** - Automatic
9. **AUX** - Auxiliary
10. **BC** – Building Controllers
11. **BI** - Binary Input
12. **BIBB** – BACnet Interoperability Building Blocks
13. **BO** - Binary Output

14. **C** - Common
15. **CHW** - Chilled Water
16. **CHWP** - Chilled Water Pump
17. **CHWR** - Chilled Water Return
18. **CHWS** - Chilled Water Supply
19. **COND** - Condenser
20. **CxA** – Commissioning Authority
21. **CW** - Condenser Water
22. **CWP** - Condenser Water Pump
23. **CWR** - Condenser Water Return
24. **CWS** - Condenser Water Supply
25. **DA** - Discharge Air
26. **DDC** – Direct Digital Control
27. **EA** - Exhaust Air
28. **EF** - Exhaust Fan
29. **EVAP** - Evaporators
30. **CU** - Fan Coil Unit
31. **HOA** - Hand / Off / Auto
32. **HP** - Heat Pump
33. **HRU** - Heat Recovery Unit
34. **HTEX** - Heat Exchanger
35. **HW** - Hot Water
36. **HWP** - Hot Water Pump
37. **HWR** - Hot Water Return
38. **HWS** - Hot Water Supply
39. **I/O** – Input/Output
40. **HWP** - Hot Water Pump
41. **HWR** - Hot Water Return
42. **HWS** - Hot Water Supply
43. **I/O** – Input/Output
44. **IP** – Internet Protocol
45. **LAN** – Local Area Network
46. **LEED** – Leadership in Energy and Environmental Design
47. **MAX** - Maximum
48. **MIN** - Minimum
49. **MISC** - Miscellaneous

50. **MS/TP** – Master Slave Token Passing
51. **NC** - Normally Closed
52. **NO** - Normally Open
53. **OA** - Outdoor Air
54. **PID** – Proportional Integral Derivative
55. **PIU** - Powered Induction Unit
56. **RA** - Return Air
57. **RF** - Return Fan
58. **RH** - Relative Humidity
59. **RTU** - Roof-top Unit
60. **SA** - Supply Air
61. **SF** - Supply Fan
62. **SP** - Static Pressure
63. **TCC** – Temperature Control Contractor
64. **TEMP** - Temperature
65. **UH** - Unit Heater
66. **UV** - Unit Ventilator
67. **VAV** - Variable Air Volume
68. **VFD** – Variable Frequency Drive
69. **VVTU** - Variable Volume Terminal Unit
70. **W/** - with
71. **W/O** - without

PART 2 PRODUCTS

2.1 MATERIALS

A. Use new products the manufacturer is currently manufacturing and selling for use in new installations. Do not use this installation as a product test site unless explicitly approved in writing by Owner. Spare parts shall be available for at least ten years after completion of this contract.

2.2 MANUFACTURERS

A. Johnson Controls, Inc.

B. Engineer Pre-Approved Equivalent.

2.3 SYSTEM DESCRIPTION

A. Automatic temperature control field monitoring and control system using field programmable micro-processor based units.

B. Base system on distributed system of fully intelligent, stand-alone controllers, operating in a multi-tasking, multi-user environment on token passing network, with central and remote hardware, software, and interconnecting wire and conduit.

C. Include computer software and hardware, operator input/output devices, control units, local area networks (LAN), sensors, control devices, actuators.

D. Controls for variable radiation, unit heaters, and the like when directly connected to the control units.

E. Provide control systems consisting of thermostats, control valves, and operators, indicating devices, interface equipment and other apparatus and accessories required to operate mechanical systems, and to perform functions specified.

F. Include installation and calibration, supervision, adjustments, and fine tuning necessary for complete and fully operational system.

2.4 COMMUNICATION

A. Control products, communication media, connectors, repeaters, hubs, and routers shall comprise a BACnet internetwork. Controller and operator interface communication shall conform to ANSI/ASHRAE Standard 135, BACnet.

B. Install new wiring and network devices as required to provide a complete and workable control network.

C. Each controller shall have a communication port for temporary connection to a laptop computer or other operator interface. Connection shall support memory downloads and other commissioning and troubleshooting operations.

D. Internetwork operator interface and value passing shall be transparent to internetwork architecture.

1. An operator interface connected to a controller shall allow the operator to interface with each internetwork controller as if directly connected. Controller information such as data, status, and control algorithms shall be viewable and editable from each internetwork controller.

2. Inputs, outputs, and control variables used to integrate control strategies across multiple controllers shall be readable by each controller on the internetwork. Program and test all cross-controller links required to execute control strategies. An authorized operator shall be able to edit cross-controller links by typing a standard object address or by using a point-and-click interface.

E. Workstations, Building Control Panels, and Controllers with real-time clocks shall use the BACnet Time Synchronization service. System shall automatically synchronize system clocks daily from an operator-designated device via the internetwork. The system shall automatically adjust for daylight saving and standard time as applicable.

F. System shall be expandable to at least twice the required input and output objects with additional controllers, associated devices, and wiring.

2.5 OPERATOR INTERFACE

A. Furnish a full graphics system to interface with the owners existing PC "operator workstation". The system shall include all software and hardware necessary to provide full graphics at the location of the existing operator workstation. Verify the available PC system data and furnish additional hardware if necessary.

2.6 CONTROLLERS

A. General: General. Provide an adequate number of Building Controllers (BC), Advanced Application Controllers (AAC), Application Specific Controllers (ASC), Smart Actuators (SA), and Smart Sensors (SS) as required to achieve performance specified. Every device in the system which executes control logic and directly controls HVAC equipment must conform to a standard BACnet Device profile as specified in ANSI/ASHRAE 135, BACnet Annex L. Unless otherwise specified, hardwired actuators and sensors may be used in lieu of BACnet Smart Actuators and Smart Sensors.

B. Stand-Alone Operation. Each piece of equipment specified shall be controlled by a single controller to provide stand-alone control in the event of communication failure. All I/O points specified for a piece of equipment shall be integral to its controller. Provide stable and reliable stand-alone control using default values or other method for values normally read over the network such as outdoor air conditions, supply air or water temperature coming from source equipment, etc.

C. Building Controllers (BC):

1. General:

a. Manage global strategies by one or more, independent, standalone, microprocessor based controllers.

b. Provide sufficient memory to support controller's operating system, database, and programming requirements.

c. Share data between networked controllers.

d. Controller operating system manages input and output communication signals allowing distributed controllers to share real and virtual object information and allowing for central monitoring and alarms.

e. Utilize real-time clock for scheduling.

f. Continuously check processor status and memory circuits for abnormal operation.

g. Controller to assume predetermined failure mode and generate alarm notification upon detection of abnormal operation.

h. Communication with other network devices to be based on assigned protocol.

2. Communication:

a. Controller to reside on a BACnet network using ISO 8802-3 (ETHERNET) Data Link/Physical layer protocol.

b. Perform routing when connected to a network of custom application and application specific controllers.

c. Provide service communication port for connection to a portable operator's terminal or hand held device with compatible protocol.

3. Anticipated Environmental Ambient Conditions:

a. Outdoors and/or in Wet Ambient Conditions:

1) Mount within waterproof enclosures.

2) Rated for operation at -20 to 140 degrees F.

b. Conditioned Space:

1) Mount within dustproof enclosures.
2) Rated for operation at 32 to 120 degrees F.

4. Provisions for Serviceability:

a. Diagnostic LEDs for power, communication, and processor.

b. Make all wiring connections to field removable, modular terminal strips, or to a termination card connected by a ribbon cable.

5. Memory: In the event of a power loss, maintain all BIOS and programming information for a minimum of 72 hours.

6. Power and Noise Immunity:

a. Maintain operation at 90 to 110 percent of nominal voltage rating.

b. Perform orderly shutdown below 80 percent of nominal voltage.

c. Operation protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W. at 3 feet.

D. Advanced (Custom) Application Controllers (AAC):

1. General:

a. Provide sufficient memory to support controller's operating system, database, and programming requirements.

b. Share data between networked, microprocessor based controllers.

c. Controller operating system manages input and output communication signals allowing distributed controllers to share real and virtual object information and allowing for central monitoring and alarms.

d. Utilize real-time clock for scheduling.

e. Continuously check processor status and memory circuits for abnormal operation.

f. Controller to assume predetermined failure mode and generate alarm notification upon detection of abnormal operation.

g. Communication with other network devices to be based on assigned protocol.

2. Communication:

a. Controller to reside on a BACnet network using MS/TP Data Link/Physical layer protocol.

b. Signal Management: Operating systems shall manage input and output communication signals to allow distributed controllers to share real and virtual object information and to allow for central monitoring and alarms

3. Anticipated Environmental Ambient Conditions:

a. Outdoors and/or in Wet Ambient Conditions:

1) Mount within waterproof enclosures.
2) Rated for operation at -20 to 140 degrees F.

b. Conditioned Space:

1) Mount within dustproof enclosures.
2) Rated for operation at 32 to 120 degrees F.

4. Provisions for Serviceability:

a. Diagnostic LED's for power, communication, and processor.

b. Make all wiring connections to field removable, modular terminal strips, or to a termination card connected by a ribbon cable.

5. Memory: In the event of a power loss, maintain all BIOS and programming information for a minimum of 72 hours.

6. Power and Noise Immunity:

a. Maintain operation at 90 to 110 percent of nominal voltage rating.

b. Perform orderly shutdown below 80 percent of nominal voltage.

c. Operation protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W. at 3 feet.

E. Application Specific Controllers (ASC):

1. General:

a. Not fully user programmable, microprocessor based controllers dedicated to control specific equipment.

b. Customized for operation within the confines of equipment served.

c. Communication with other network devices to be based on assigned protocol.

2. Communication:

a. Controller to reside on a BACnet network using MS/TP Data Link/Physical layer protocol.

b. Provide service communication port for connection to a portable operator's terminal or hand held device with compatible protocol.

3. Anticipated Environmental Ambient Conditions:

a. Outdoors and/or in Wet Ambient Conditions:

1) Mount within waterproof enclosures.
2) Rated for operation at -20 to 140 degrees F.

b. Conditioned Space:

1) Mount within dustproof enclosures.
2) Rated for operation at 32 to 120 degrees F.

4. Provisions for Serviceability:

a. Diagnostic LEDs for power, communication, and processor.

b. Make all wiring connections to field removable, modular terminal strips, or to a termination card connected by a ribbon cable.

5. Memory: In the event of a power loss, maintain all BIOS and programming information for a minimum of 72 hours.
6. Power and Noise Immunity:
   a. Maintain operation at 90 to 110 percent of nominal voltage rating.
   b. Perform orderly shutdown below 80 percent of nominal voltage.
   c. Operation protected against electrical noise of 5 to 120 Hz and from keyed radios up to 5 W at 3 feet.
7. Transformer:
   a. ASC power supply shall be fused or current limiting and shall be rated at a minimum of 125% of ASC power consumption.

F. Input/Output Interface:
1. Hardwired inputs and outputs tie into the DDC system through building, custom application, or application specific controllers.
2. All Input/Output Points:
   a. Protect controller from damage resulting from any point short-circuiting or grounding and from voltage up to 24 volts of any duration.
   b. Provide universal type for building and custom application controllers where input or output is software designated as either binary or analog type with appropriate properties.
3. Binary Inputs:
   a. Allow monitoring of On/Off signals from remote devices.
   b. Provide wetting current of 12 mA minimum, compatible with commonly available control devices and protected against the effects of contact bounce and noise.
   c. Sense dry contact closure with power provided only by the controller.
4. Pulse Accumulation Input Objects: Comply with all requirements of binary input objects and accept up to 10 pulses per second.
5. Analog Inputs:
   a. Allow for monitoring of low voltage 0 to 10 VDC, 4 to 20 mA current, or resistance signals (thermistor, RTD).
   b. Compatible with and field configurable to commonly available sensing devices.
6. Binary Outputs:
   a. Used for On/Off operation or a pulsed low-voltage signal for pulse width modulation control.
   b. Outputs provided with three position (On/Off/Auto) override switches.

c. Status lights for building and custom application controllers to be selectable for normally open or normally closed operation.

7. Analog Outputs:

a. Monitoring signal provides a 0 to 10 VDC or a 4 to 20 mA output signal for end device control.

b. Provide status lights and two position (AUTO/MANUAL) switch for building and custom application controllers with manually adjustable potentiometer for manual override on building and custom application controllers.

c. Drift to not exceed 0.4 percent of range per year.

8. Tri State Outputs:

a. Coordinate two binary outputs to control three point, floating type, electronic actuators without feedback.

b. Limit the use of three point, floating devices to the following zone and terminal unit control applications:

1) Radiation.

c. Control algorithms run the zone actuator to one end of its stroke once every 24 hours for verification of operator tracking.

9. Universal Inputs and Outputs

a. Inputs and outputs that can be designated as either binary or analog in software shall conform to the provisions of this section that are appropriate for their designated use.

10. System Object Capacity:

a. System size to be expandable to twice the number of input output objects required by providing additional controllers, including associated devices and wiring.

b. Hardware additions or software revisions for the installed operator interfaces are not to be required for future, system expansions.

2.7 POWER SUPPLIES AND LINE FILTERING

A. Power Supplies:

1. Provide UL listed control transformers with Class 2 current limiting type or over-current protection in both primary and secondary circuits for Class 2 service as required by the NEC.
2. Limit connected loads to 80 percent of rated capacity.
3. Match DC power supply to current output and voltage requirements.
4. Unit to be full wave rectifier type with output ripple of 5.0 mV maximum peak to peak.
5. Regulation to be 1 percent combined line and load with 100 microsecond response time for 50 percent load changes.
6. Provide over-voltage and over-current protection to withstand a 150 percent current overload for 3 seconds minimum without trip-out or failure.

7. Operational Ambient Conditions: 32 to 120 degrees F.
8. EM/RF meets FCC Class B and VDE 0871 for Class B and MIL-STD-810 for shock and vibration.
9. Line voltage units UL recognized and CSA approved.

B. Power Line Filtering:

1. Provide external or internal transient voltage and surge suppression component for all workstations and controllers.
2. Minimum surge protection attributes:
   a. Dielectric strength of 1000 volts minimum.
   b. Response time of 10 nanoseconds or less.
   c. Transverse mode noise attenuation of 65 dB or greater.
   d. Common mode noise attenuation of 150 dB or greater at 40 to 100 Hz.

2.8 LOCAL AREA NETWORK (LAN)

A. Provide communication between control units over local area network (LAN).

B. Break in Communication Path: Alarm and automatically initiate LAN reconfiguration.

C. Communication Techniques: Allow interface into network by multiple operation stations and by auto-answer/auto-dial modems. Support communication over telephone lines utilizing modems.

D. Transmission Median: Fiber optic or single pair of solid 24 gauge twisted, shielded copper cable.

E. Network Support: Time for global point to be received by any station, shall be less than 3 seconds. Provide automatic reconfiguration if any station is added or lost. If transmission cable is cut, reconfigure two sections with no disruption to system's operation, without operator intervention.

2.9 POWER FAIL RESTART

A. In the event of the loss of normal power, there shall be an orderly shutdown of the digital panels and workstation to prevent the loss of data base or operating system software. Non-volatile memory shall be incorporated for all critical controller configuration data, and battery backup shall be provided to support the clock and all volatile memory for a minimum of 72 hours.

B. Upon restoration of normal power, the panels shall automatically resume full operation without manual intervention.

C. Should Digital panel memory be lost for any reason, the user shall have the capability of reloading the panel via the local RS-232 port, or telephone line dial-in.

2.10 AUXILIARY CONTROL DEVICES

A. Motorized Control Dampers: Unless otherwise specified elsewhere, dampers shall be as follows.

1. Low leakage dampers shall be by Ruskin or approved equal.

2. Damper leakage ratings shall be certified in accordance with AMCA Standard 500-D.
3. Provide any automatic control dampers not specified to be integral with other equipment.
4. All blade edges and top and bottom of frame shall be provided with compressible seals. Side seals shall be compressible stainless steel of the tight-seal spring type.
5. Dampers shall be sized to meet flow requirements of the application. The sheet metal contractor shall furnish and install baffles to fit the damper to duct size. Baffles shall not exceed 6 inches.
6. Where ultra-low leakage dampers are specified the blade edges shall be fitted with replaceable, snap-on, inflatable seals to limit damper leakage to 6 cfm per square foot for dampers in excess of sixteen inches square at 1 inch of w.c.
7. Type: Control dampers shall be the parallel or opposed-blade type as specified below or as scheduled on drawings.
    a. Outdoor and return air mixing dampers and face-and-bypass dampers shall be opposed-blade and shall direct airstreams toward each other.
    b. Other modulating dampers shall be opposed-blade.
    c. Two-position shutoff dampers shall be parallel- or opposed-blade with blade and side seals.
8. Frame: Damper frames shall be 2.38 mm (13 gauge) galvanized steel channel or 3.175 mm (1/8 inch) extruded aluminum with reinforced corner bracing. Frame construction shall not be less than 14 gauge galvanized steel or extruded aluminum at a minimum 4-1/2 inch X 1 inch X 0.125 inch in thickness.
9. Blades: Damper blades shall not exceed 20 cm (8 inch) in width or 125 cm (48 inch) in length. Blades shall be suitable for medium velocity (10 m/s [2000 fpm]) performance. Blades shall be not less than 1.5875 mm (16 gauge).
10. Shaft Bearings: Damper shaft bearings shall be as recommended by manufacturer for application, oil impregnated sintered bronze, or better.
11. Seals: Blade edges and frame top and bottom shall have replaceable seals of butyl rubber or neoprene. Side seals shall be spring-loaded stainless steel. Blade seals shall leak no more than 50 liters per second per square meter (10 cfm per square foot) at 1000 Pa (4 in. w.g.) differential pressure. Blades shall be airfoil type suitable for wide-open face velocity of 7.5 m/s (1500 fpm).
12. Sections: Individual damper sections shall not exceed 125 cm x 150 cm (48 in. x 60 in.). Each section shall have at least one damper actuator.
13. Axles shall be a minimum of 1/2” diameter and be welded to blade or riveted to blade
14. Modulating dampers shall provide a linear flow characteristic where possible.
15. Linkages: Dampers shall have exposed linkages.

B. Electric Valve Actuators:
    1. General:
        a. For dampers, the actuators used shall be provided from a single manufacturer. Furnish a separate damper actuator for each damper greater than 48 inches (1220 mm) in any dimension.

b. For valves, the actuators used shall be provided from a single manufacturer

c. Actuators shall be provided from a manufacturer registered under ISO9001:2000.

d. All rotary spring return actuators shall be capable of both clockwise and counter clockwise spring return operation. Linear actuators shall spring return to the retracted position.

e. All non-spring return actuators shall have an external manual gear release to allow manual positioning of the damper when the actuator is not powered. Spring return actuators with more than 60 in-lb. torque capacity shall have a manual crank for this purpose.

f. All modulating actuators shall have an external, built-in switch to allow the reversing of direction of rotation.

g. Actuators shall be provided with a conduit fitting and a minimum 1m electrical cable and shall be pre-wired to eliminate the necessity of opening the actuator housing to make electrical connections.

h. Actuators shall be designed for a minimum of 60,000 full stroke cycles at the actuator's rated torque. Actuators shall include a stroke limiting device.

2. Stall Protection: Mechanical or electronic stall protection shall prevent actuator damage throughout the actuator’s rotation.
3. Spring-return Mechanism: Actuators used for power-failure and safety applications shall have an internal mechanical spring-return mechanism or an uninterruptible power supply (UPS).
4. Signal and Range: Proportional actuators shall accept a 0–10 Vdc or a 0–20 mA control signal and shall have a 2–10 Vdc or 4–20 mA operating range. (Floating motor actuators may be substituted for proportional actuators in terminal unit applications as described in paragraph 2.6H.)
5. Wiring: 24 Vac and 24 Vdc actuators shall operate on Class 2 wiring.
6. Manual Positioning: Operators shall be able to manually position each actuator when the actuator is not powered. Non-spring-return actuators shall have an external manual gear release. Spring-return actuators with more than 7 N·m (60 in.-lb) torque capacity shall have a manual crank.
7. Electronic Damper Actuators:
   a. Coupling: V-bolt dual nut clamp with a V-shaped, toothed cradle.
   b. Mounting: Actuators shall be capable of being mechanically and electrically paralleled to increase torque if required.
   c. Overload Protection: Electronic overload or digital rotation-sensing circuitry without the use of end switches to prevent any damage to the actuator during a stall condition.
8. Electronic Valve Actuators:
   a. Coupling: Directly couple end mount to stem, shaft, or ISO-style direct-coupled mounting pad.

b. Mounting: Actuators shall be capable of being mechanically and electrically paralleled to increase torque if required.

c. Overload Protection: Electronic overload or digital rotation-sensing circuitry without the use of end switches to deactivate the actuator at the end of rotation.

9. Terminal Unit Actuators:

a. Close-off (Differential) Pressure Rating: 200 psi.

b. Coupling: V-bolt dual nut clamp with a V-shaped, toothed cradle or an ISO-style direct-coupled mounting pad.

C. Control Valves:

1. Control valves shall be two-way or three-way type for two-position or modulating service as shown.
2. Close-off (differential) Pressure Rating: Valve actuator and trim shall be furnished to provide the following minimum close-off pressure ratings:

a. Water Valves:

1) Two-way: 150% of total system (pump) head.
2) Three-way: 300% of pressure differential between ports A and B at design flow or 100% of total system (pump) head.

3. Where specified, ball-style body automatic control valves shall adhere to the following:

a. NPS 3 and Smaller: Nickel-plated forged brass body rated at no less than 400 psi, stainless steel ball and blowout proof stem, NPT female end fittings, with a dual EPDM O-ring packing design, fiberglass reinforced Teflon seats, and a Tefzel flow characterizing disc.

b. Sizing:

1) Two-Position: Line size or size using a pressure differential of 1 psi.
2) 2-way Modulating: 5 psig or twice the load pressure drop, whichever is greater.
3) 3-way Modulating: Twice the load pressure drop, but not more than 5 psig.

c. Close-off Pressure Rating: 100 psi. NPS ¾” and Smaller for Terminal Units: 200 psi.

d. The actuator shall be the same manufacturer as the valve, integrally mounted to the valve at the factory with a single screw on a four-way DIN mounting-base.

e. All control ball valves shall feature characterized flow guides when used for modulating applications.

4. Where specified, butterfly control valves shall adhere to the following:

a. NPS 2 to 12: Valve body shall be full lugged cast iron 200 psig body with a 304 stainless steel disc, EPDM seat, extended neck and shall meet ANSI Class 125/150 flange standards. Disc-to-stem connection shall utilize an internal spline. External mechanical methods to achieve this mechanical connection, such as pins or screws, are not acceptable. The shaft shall be supported at four locations by RPTFE bushings.

b. Sizing:

1) Two-Position: Line size or size using a pressure differential of 1 psi.
2) Modulating: 5 psig or twice the load pressure drop, whichever is greater. Size for the design flow with the disc in a 60° open-position with the design velocity less than 12 feet per second.

c. Close-off Pressure Rating:

1) NPS 2” to 12” 200 psi bubble tight shutoff.

5. On/Off, Two-Position Applications:

a. NPS 1 and Smaller: Forged brass body, rated at no less than 300 psi, female NPT union or sweat with a stainless steel stem and EPDM seals.

b. Sizing: Two-Position: Line size or size using a pressure differential of 1 psi.

c. Close-off Pressure Rating: Combination of actuator and trim shall provide minimum close-off pressure rating of 150% of total system head pressure for 2-way valves and 125% of the design pressure differential across the 3-way valves.

d. The actuator shall be the same manufacturer as the valve, integrally mounted to the valve at the factory.

2.11 SENSORS AND DEVICES

A. Input/output sensors and devices shall be closely matched to the requirements of the BAS controller for accurate, responsive, noise-free signal input/output. Control input response shall be high sensitivity and matched to the loop gain requirements for precise and responsive control.

B. Sensors and transmitters shall be manually calibrated on site so that the wiring length does not detract from the sensor accuracy specified.

C. Provide guards (plastic or wire) for sensors, thermostats, and transmitters that are installed in public areas such as gymnasiums, classrooms, corridors, and vestibules.

D. Temperature Sensors:

1. Sensors shall have ±1.0 ˚F accuracy between 32 ˚F and 212 ˚F.
2. Type: Temperature sensors shall be Resistance Temperature Device (RTD) or thermistor.
3. Temperature Sensor – Immersion: Provide thermo-well mounted temperature sensors as indicated in the control sequences and diagrams as follows:

a. Temperature sensors shall meet, at minimum, the following requirements:

b. Rigid 0.25 inch stainless steel probe of length, which is, at minimum, 20% of the pipe width.

c. Thermistor or RTD Compatible with BMS sealed in probe with three-part moisture protection system.

d. BMS shall report the monitored temperature with an accuracy of 1.0°F

e. ABS housing with conduit entrance. (Optional metal or weather proof available)

f. Provide Brass or Stainless steel thermowell (316 or 304).

g. Provide with thermal grease to aid temperature sensing.

4. Temperature Sensor – Wall Mounted: Provide wall mounted stainless plate temperature sensors as indicated in the control sequences and diagrams as follows:

   a. Temperature sensors shall meet, at minimum, the following requirements:

   b. Stainless plate sensors to fit 4 inch X 2 inch junction box, available with tamperproof screws.

   c. Thermistor or RTD compatible with BMS.

   d. Mounting: typical space sensors at 48 inches above floor to center; sensors in common areas at 96 inches above floor to center.

5. Where reference is made on the drawings for a RTD transmitter, transmitters shall meet at minimum the following requirements:

   a. 100 ohm or 1000 ohm PT RTD.

   b. 24V ac/dc power supply.

   c. 4-20 mA, 0-10Vdc or 0-5Vdc outputs compatible with BMS.

   d. Electronics accuracy of +/-0.1% of span.

   e. Operating temperature range of 32˚F to 158˚F. Outside air only - operating temperature range of -40˚F to 185˚F.

6. Temperature Sensor – Strap-On: Provide strap-on mounted temperature sensors as indicated in the control sequences and diagrams or where thermo well mounted sensors cannot be mounted. Temperature sensors shall meet, at minimum, the following requirements:

   a. 0.25 inch Stainless steel probe, 2 inches.

   b. Thermistor or RTD compatible with BMS, sealed in probe with a three part moisture protection system.

   c. ABS housing with conduit entrance. (Optional metal or weather proof available)

7. Temperature Sensor – Strap-On – Plate: Provide strap-on mounted temperature sensors as indicated in the control sequences and diagrams or where thermo well mounted sensors cannot be mounted. Temperature sensors shall meet, at minimum, the following requirements:

   a. Thermistor or RTD compatible with BMS, sealed in probe with a three part moisture protection system.

   b. A single point strap-on temperature sensor to be precision bonded to a 1.5 inch x 1.5 inch aluminum plate and adhered to a 1.5 inch x 1 inch compressible foam. A 10 inch S/S Pipe clamp to be provided to secure the assembly to various sizes of pipe.

   c. ABS housing with conduit entrance. (Optional metal or weather proof available).

E. Relays:

1. Control Relays. Control relays shall be plug-in type, UL listed, and shall have dust cover and LED “energized” indicator. Contact rating, configuration, and coil voltage shall be suitable for application.
2. Time Delay Relays. Time delay relays shall be solid-state plug-in type, UL listed, and shall have adjustable time delay. Delay shall be adjustable ±100% from setpoint shown. Contact rating, configuration, and coil voltage shall be suitable for application. Provide NEMA 1 enclosure for relays not installed in local control panel.
3. Relays shall meet, at minimum, the following specifications:
    a. Rated for the applicable load.
    b. The output relay shall have an accessible trip adjustment over its complete operating range. Provide LED indication of relay status.
    c. Current relay shall have input and output isolation via current transformer.
    d. Current relay shall be self-powered with no insertion loss.
    e. Relay shall be in a dustproof housing.
    f. 6. Accuracy to be <2% of full-scale max.
    g. Temperature rating of 5˚F to 140˚F.
    h. Whenever the status of a single speed motor is monitored it shall be done via a current sensing relay.
    i. The BMS contractor shall provide current sensing relays at the MCC starters.
    j. The BMS contractor shall provide the current sensing relays for motors with local starters and no MCC starter.

F. Override Timers:
1. Unless implemented in control software, override timers shall be spring-wound line voltage, UL Listed, with contact rating and configuration required by application. Provide 0–6 hour calibrated dial unless otherwise specified. Flush mount timer on local control panel face or where shown.

G. Current Transmitters:
1. AC current transmitters shall be self-powered, combination split-core current transformer type with built-in rectifier and high-gain servo amplifier with 4–20 mA two-wire output. Full-scale unit ranges shall be 10 A, 20 A, 50 A, 100 A, 150 A, and 200 A, with internal zero and span adjustment. Unit accuracy shall be ±1% full-scale at 500 ohm maximum burden.
2. Transmitter shall meet or exceed ANSI/ISA S50.1 requirements and shall be UL/CSA recognized.
3. Unit shall be split-core type for clamp-on installation on existing wiring.

H. Current Transformers:
1. Control transformers shall be UL listed, Class 2 current-limiting type, or shall be furnished with over-current protection in both primary and secondary circuits for Class 2 service.

2. Unit output shall match the required output current and voltage requirements. Current output shall allow for a 50% safety factor. Output ripple shall be 3.0 mV maximum Peak-to-Peak. Regulation shall be 0.10% line and load combined, with 50 microsecond response time for 50% load changes. Unit shall have built-in over-voltage protection.
3. Unit shall operate between 32 °F to 122 °F (0° C and 50° C).
4. Transformers shall be available in various current ratios and shall be selected for ±1% accuracy at 5 A full-scale output.
5. Use fixed-core transformers for new wiring installation and split-core transformers for existing wiring installation.

I. Voltage Transmitters:

1. AC voltage transmitters shall be self-powered single-loop (two-wire) type, 4–20 mA output with zero and span adjustment.
2. Adjustable full-scale unit ranges shall be 100–130 Vac, 200–250 Vac, 250–330 Vac, and 400–600 Vac. Unit accuracy shall be ±1% full-scale at 500 ohm maximum burden.
3. Transmitters shall meet or exceed ANSI/ISA S50.1 requirements and shall be UL/CSA recognized at 600 Vac rating.

J. Voltage Transformers:

1. AC voltage transformers shall be UL/CSA recognized, 600 Vac rated, and shall have built-in fuse protection.
2. Transformers shall be suitable for ambient temperatures of 4°C–55°C (40°F–130°F) and shall provide ±0.5% accuracy at 24 Vac and 5 VA load.
3. Windings (except for terminals) shall be completely enclosed with metal or plastic.

K. Power Monitors:

1. Selectable rate pulse output for kWh reading, 4–20 mA output for kW reading, N.O. alarm contact, and ability to operate with 5.0 amp current inputs or 0–0.33 volt inputs.
2. 1.0% full-scale true RMS power accuracy, +0.5 Hz, voltage input range 120–600 V, and auto range select.
3. Under voltage/phase monitor circuitry.
4. NEMA 1 enclosure.
5. Current transformers having a 0.5% FS accuracy, 600 VAC isolation voltage with 0–0.33 V output. If 0–5 A current transformers are provided, a three-phase disconnect/shorting switch assembly is required.

L. Current Switches:

1. Current-operated switches shall be self-powered, solid-state with adjustable trip current. Select switches to match application current and DDC system output requirements.

M. Pressure Transducers:

1. Transducers shall have linear output signal and field-adjustable zero and span.
2. Transducer sensing elements shall withstand continuous operating conditions of positive or negative pressure 50% greater than calibrated span without damage.

3. Water pressure transducer diaphragm shall be stainless steel with minimum proof pressure of 1000 kPa (150 psi). Transducer shall have 4–20 mA output, suitable mounting provisions, and block and bleed valves.
4. Water differential pressure transducer diaphragm shall be stainless steel with minimum proof pressure of 1000 kPa (150 psi). Over-range limit (differential pressure) and maximum static pressure shall be 2000 kPa (300psi). Transducer shall have 4–20 mA output, suitable mounting provisions, and 5-valve manifold.

N. Local Control Panels:

1. All indoor control cabinets shall be fully enclosed NEMA 1 construction with (hinged door) key-lock latch and removable subpanels. A single key shall be common to all field panels and subpanels.
2. Interconnections between internal and face-mounted devices shall be prewired with color-coded stranded conductors neatly installed in plastic troughs and/or tie-wrapped. Terminals for field connections shall be UL listed for 600 volt service, individually identified per control/ interlock drawings, with adequate clearance for field wiring. Control terminations for field connection shall be individually identified per control drawings.
3. Provide ON/OFF power switch with overcurrent protection for control power sources to each local panel.

O. Combination Room Temperature Sensor:

1. Occupant-focused, communicating room sensor, providing precise temperature sensing for an all-in-one room device
2. Device shall be a combination temperature sensor and input array that communicates with field controller.
    a. On board temperature sensor:
        1) Range of 41˚F to 104˚F.
        2) Accuracy of 0.9˚F.
        3) Resolution of 0.18˚F.
3. Dual connector ports for field controller connection shall support both power and communication, with provision for “daisy-chain” connection, so that more than one communicating sensor can be used with a single field controller. Dual connector ports shall be female RJ45 ports, and shall be compatible with standard Ethernet pinout T568B.
4. Hardware options in combinations in any and all of the following:
    a. Temperature Setpoint Offset Adjustment
        1) “Infinite” Rotary Knob for setpoint offset.

P. Discrete Combination Sensor:

1. Discrete communicating sensor combining precise environmental sensing – temperature and humidity for applications requiring no occupant driven overrides
2. Dual connector ports for connection to field controller shall support both power and communication, with provision for “daisy-chain” connection, so that more than one communicating sensor can be used with a single field controller.Dual connector ports shall be female RJ45 ports, and shall be compatible with standard Ethernet pinout T568B.
3. Hardware options in combinations of any and all of the following:

a. On board temperature sensor:

1) Range of 41˚F to 104˚F.
2) Accuracy of 0.9˚F.
3) Resolution of 0.18˚F.

b. On-board humidity sensor:

1) Accuracy of 3% RH
2) Resolution of 1% RH

2.12 WIRING AND RACEWAYS

A. General. Provide copper wiring, plenum cable, and raceways as specified in applicable sections of Division 26.

B. Insulated wire shall use copper conductors and shall be UL listed for 90°C (200°F) minimum service.

C. Wire shall be a minimum of #18 gauge, color coded, stranded wire for all low voltage, electronic circuit with "spares" installed (one for every group of 10 wires) in conduit.

D. Coordinate the requirements for 120V circuits for the ASC's. All control transformers shall be the responsibility of this contractor. Reference the electrical drawings for circuit locations.

E. All BACNet IP and/or Ethernet cabling based connections shall be the responsibility of the Temperature Controls Contractor. Coordinate cable type, termination location, and cable routing with owner's IT personnel.

PART 3 EXECUTION

3.1 GENERAL

A. All HVAC equipment control points recognized by the controllers, both factory and field installed, shall be integrated into the new BAS for full control and manipulation via the operator's interface/workstation.

1. The BAS personnel must utilize their own license while on site and not use the Owner's license to access the control system.

B. Each piece of equipment with potential of being automatically locked out of operation due to unit fault(s) shall be capable of being reset remotely from the Owner's workstation. Specific procedures to do so shall be demonstrated for each type of equipment installed on this project.

C. Owner's requirements for graphics:

1. Nomenclature used must be consistent throughout all graphics.
2. All graphics to be adjusted accordingly to reduce clutter. Additional page(s) must be added in required. Boxes shall not be used unless necessary.
3. HVAC equipment to have animated fans, pumps, water flow, air flow, etc. to indicate actual conditions (status not commanded state).
4. Home page should include links for each major piece of equipment (air handling unit, chiller, boiler, lighting, utilities, exhaust fans, etc).
5. Display the fire alarm activation point on the home page.

6. Display outside air temperature and humidity at top of each graphics page.
7. Floor plan graphics should indicate location of duct static sensors, outside air reference sensor, building static sensor, differential pressure transmitter (water), gas meter, water meter, GPM meters, etc.
8. Graphics must exactly match the equipment and components to reflect the actual items installed.
9. Each graphics page shall contain a link to the control diagram and sequence for that particular piece of equipment.
10. The 'effective set point' shall be displayed on each graphic.
11. Thermostat adjustment shall be displayed on each graphic.
12. Provide floor plan graphics with accurate room numbers in large print with a selectable box displaying the room temperature. Selecting the temperature box will open that specific room's unit graphic.
13. Provide direct link to sequence of operation from the graphic page for each piece of equipment.
14. Show run time hours for each piece of equipment (i.e. pumps) that has a rotation schedule.
15. Provide summary page to show current data for all heat pump/terminal units.
16. All major equipment home page shall have a descriptor of area(s) served and associated terminal boxes/units if applicable.
17. Labels shown on graphic shall be intuitive (i.e. dampers and valves should show percent open or open/closed if two position, heat pump reversing valves should read heat/cool).

3.2 EXAMINATION

A. Verify existing conditions before starting work. Any discrepancies, conflicts, or omissions shall be reported to the engineer for resolution before rough-in work is started.

B. Verify that conditioned power supply is available to the control units and to the operator work station. Verify that field end devices, wiring, and pneumatic tubing is installed prior to installation proceeding.

C. The project plans shall be thoroughly examined for control device and equipment locations. Any discrepancies, conflicts, or omissions shall be reported to the architect/engineer for resolution before rough-in work is started.

D. The contractor shall examine the drawings and specifications for other parts of the work. If head room or space conditions appear inadequate—or if any discrepancies occur between the plans and the contractor’s work and the plans and the work of others—the contractor shall report these discrepancies to the engineer and shall obtain written instructions for any changes necessary to accommodate the contractor’s work with the work of others. Any changes in the work covered by this specification made necessary by the failure or neglect of the contractor to report such discrepancies shall be made by—and at the expense of—this contractor.

3.3 PROTECTION

A. The contractor shall protect all work and material from damage by his/her work or employees and shall be liable for all damage thus caused.

B. The contractor shall be responsible for his/her work and equipment until finally inspected, tested, and accepted. The contractor shall protect any material that is not immediately installed. The contractor shall close all open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects.

3.4 COORDINATION

A. Site:

1. Where the mechanical work will be installed in close proximity to, or will interfere with, work of other trades, the contractor shall assist in working out space conditions to make a satisfactory adjustment. If the contractor installs his/her work before coordinating with other trades, so as to cause any interference with work of other trades, the contractor shall make the necessary changes in his/her work to correct the condition without extra charge.
2. Coordinate and schedule work with other work in the same area and with work dependent upon other work to facilitate mutual progress.

B. Test and Balance:

1. The contractor shall furnish a single set of all tools necessary to interface to the control system for test and balance purposes.
2. The contractor shall provide training in the use of these tools. This training will be planned for a minimum of 4 hours.
3. In addition, the contractor shall provide a qualified technician to assist in the test and balance process, until the first 20 terminal units are balanced.
4. The tools used during the test and balance process will be returned at the completion of the testing and balancing.

C. Coordination with controls specified in other sections or divisions: Other sections and/or divisions of this specification include controls and control devices that are to be part of or interfaced to the control system specified in this section. These controls shall be integrated into the system and coordinated by the contractor as follows:

1. All communication media and equipment shall be provided as specified in this Section.
2. Each supplier of a controls product is responsible for the configuration, programming, start up, and testing of that product to meet the sequences of operation described on the plans.
3. The contractor shall coordinate and resolve any incompatibility issues that arise between control products provided under this section and those provided under other sections or divisions of this specification.
4. The contractor is responsible for providing all controls described in the contract documents regardless of where within the contract documents these controls are described.
5. The contractor is responsible for the interface of control products provided by multiple suppliers regardless of where this interface is described within the contract documents.

3.5 GENERAL WORKMANSHIP

A. Install equipment, piping, and wiring/raceway parallel to building lines (i.e. horizontal, vertical, and parallel to walls) wherever possible.

B. Provide sufficient slack and flexible connections to allow for vibration of piping and equipment.

C. Install equipment in readily accessible locations as defined by Chapter 1 Article 100 Part A of the National Electrical Code (NEC).

D. Verify integrity of all wiring to ensure continuity and freedom from shorts and grounds.

E. All equipment, installation, and wiring shall comply with industry specifications and standards for performance, reliability, and compatibility and be executed in strict adherence to local codes and standard practices.

3.6 FIELD QUALITY CONTROL

A. All work, materials, and equipment shall comply with rules and regulations of applicable local, state, and federal codes and ordinances as identified in Part 1 of this Section.

B. Contractor shall continually monitor the field installation for code compliance and quality of workmanship.

C. Contractor shall have work inspection by state authorities having jurisdiction over the work.

3.7 ELECTRICAL POWER

A. The contractor is responsible for providing all required electrical power to the temperature control system.

3.8 WIRING

A. All control and interlock wiring shall comply with national and local electrical codes, and Division 26 of this specification. Where the requirements of this section differ from Division 26, the requirements of this section shall take precedence.

B. All NEC Class 1 (line voltage) wiring shall be UL listed in approved raceway according to NEC and Division 26 requirements.

C. All low-voltage wiring shall meet NEC Class 2 requirements. Low-voltage power circuits shall be subfused when required to meet Class 2 current limit.

D. Where NEC Class 2 (current-limited) wires are in concealed and accessible locations, including ceiling return air plenums, approved cables not in raceway may be used provided that cables are UL listed for the intended application.

E. All wiring in mechanical, electrical, or service rooms – or where subject to mechanical damage – shall be installed in raceway (conduit) .

F. Do not install Class 2 wiring in raceways containing Class 1 wiring. Boxes and panels containing high-voltage wiring and equipment may not be used for low-voltage wiring except for the purpose of interfacing the two (e.g. relays and transformers).

G. Do not install wiring in raceway containing tubing.

H. Where Class 2 wiring is run exposed, wiring is to be run parallel along a surface or perpendicular to it and neatly tied at 3 m (10 ft) intervals.

I. Where plenum cables are used without raceway, they shall be supported from or anchored to structural members. Cables shall not be supported by or anchored to ductwork, electrical raceways, piping, or ceiling suspension systems.

J. All wire-to-device connections shall be made at a terminal block or terminal strip. All wire-to-wire connections shall be at a terminal block.

K. All wiring within enclosures shall be neatly bundled and anchored to permit access and prevent restriction to devices and terminals.

L. Maximum allowable voltage for control wiring shall be 120 V. If only higher voltages are available, the contractor shall provide step-down transformers.

M. All wiring shall be installed as continuous lengths, with no splices permitted between termination points.

N. Install plenum wiring in sleeves where it passes through walls and floors. Maintain fire rating at all penetrations.

O. All exposed wiring shall be plenum rated.

P. Size of raceway and size and type of wire type shall be the responsibility of the contractor in keeping with the manufacturer’s recommendations and NEC requirements, except as noted elsewhere.

Q. Include one pull string in each raceway 2.5 cm (1 in.) or larger.

R. Use color-coded conductors throughout with conductors of different colors.

S. Control and status relays are to be located in designated enclosures only. These enclosures include packaged equipment control panel enclosures unless they also contain Class 1 starters.

T. Conceal all raceways except within mechanical, electrical, or service rooms. Install raceway to maintain a minimum clearance of 15 cm (6 in.) from high-temperature equipment (e.g. steam pipes or flues).

U. Secure raceways with raceway clamps fastened to the structure and spaced according to code requirements. Raceways and pull boxes may not be hung on flexible duct strap or tie rods. Raceways may not be run on or attached to ductwork.

V. Adhere to this specification's Division 26 requirements where raceway crosses building expansion joints.

W. Install insulated bushings on all raceway ends and openings to enclosures. Seal top end of vertical raceways.

X. The contractor shall terminate all control and/or interlock wiring and shall maintain updated (as-built) wiring diagrams with terminations identified at the job site.

Y. Flexible metal raceways and liquid-tight flexible metal raceways shall not exceed 1 m (3 ft) in length and shall be supported at each end. Flexible metal raceway less than ½ in. electrical trade size shall not be used. In areas exposed to moisture, including chiller and boiler rooms, liquid-tight, flexible metal raceways shall be used.

Z. Raceway must be rigidly installed, adequately supported, properly reamed at both ends, and left clean and free of obstructions. Raceway sections shall be joined with couplings (according to code). Terminations must be made with fittings at boxes, and ends not terminating in boxes shall have bushings installed.

3.9 COMMUNICATION WIRING

A. The contractor shall adhere to the items listed in the "Wiring" article in Part 3 of the specification.

B. All cabling shall be installed in a neat and workmanlike manner. Follow manufacturer's installation recommendations for all communication cabling

C. Do not install communication wiring in raceways and enclosures containing Class 1 or other Class 2 wiring.

D. Maximum pulling, tension, and bend radius for the cable installation, as specified by the cable manufacturer, shall not be exceeded during installation.

E. Contractor shall verify the integrity of the entire network following cable installation. Use appropriate test measures for each particular cable.

F. When a cable enters or exits a building, a lightning arrestor must be installed between the lines and ground. The lighting arrestor shall be installed according to manufacturer's instructions.

G. All runs of communication wiring shall be unspliced length when that length is commercially available.

H. All communication wiring shall be labeled to indicate origination and destination data.

I. Grounding of coaxial cable shall be in accordance with NEC regulations article on "Communications Circuits, Cable, and Protector Grounding."

J. BACnet MS/TP communications wiring shall be installed in accordance with ASHRAE/ANSI Standard 135. This includes but is not limited to:

1. The network shall use shielded, twisted-pair cable with characteristic impedance between 100 and 120 ohms. Distributed capacitance between conductors shall be less than 100 pF per meter (30 pF per foot.)
2. The maximum length of an MS/TP segment is 1200 meters (4000 ft) with AWG 18 cable. The use of greater distances and/or different wire gauges shall comply with the electrical specifications of EIA-485.
3. The maximum number of nodes per segment shall be 32, as specified in the EIA 485 standard. Additional nodes may be accommodated by the use of repeaters.
4. An MS/TP EIA-485 network shall have no T connections.

3.10 INSTALLATION OF SENSORS

A. Install sensors in accordance with the manufacturer's recommendations.

B. Mount sensors rigidly and adequately for environment within which the sensor operates.

C. Room temperature sensors shall be installed on concealed junction boxes properly supported by wall framing.

D. Check and verify location of thermostats with plans and room details before installation. Install thermostats 48 inches above floor to meet the Americans with Disabilities Act (ADA). Align with lighting switches and humidistats.

E. All wires attached to sensors shall be sealed in their raceways or in the wall to stop air transmitted from other areas from affecting sensor readings.

F. Install outdoor air temperature sensors on north wall, complete with sun shield at designated location.

G. Install humidity sensors for duct mounted humidifiers at least 3 m (10 ft) downstream of the humidifier. Do not install filters between the humidifier and the sensor.

3.11 ACTUATORS

A. General: Mount and link control damper actuators according to manufacturer's instructions.

1. To compress seals when spring-return actuators are used on normally closed dampers, power actuator to approximately 5° open position, manually close the damper, and then tighten the linkage.
2. Check operation of damper/actuator combination to confirm that actuator modulates damper smoothly throughout stroke to both open and closed positions.
3. Provide all mounting hardware and linkages for actuator installation.

B. Electric/Electronic:

1. Dampers: Actuators shall be direct mounted on damper shaft or jackshaft unless shown as a linkage installation. For low-leakage dampers with seals, the actuator shall be mounted with a minimum 5° travel available for tightening the damper seal. Actuators shall be mounted following manufacturer’s recommendations.
2. Valves: Actuators shall be connected to valves with adapters approved by the actuator manufacturer. Actuators and adapters shall be mounted following the actuator manufacturer's recommendations.

3.12 CONTROL VALVE INSTALLATION

A. Valve submittals shall be coordinated for type, quantity, size, and piping configuration to ensure compatibility with pipe design.

B. Slip-stem control valves shall be installed so that the stem position is not more than 60 degrees from the vertical up position. Ball type control valves shall be installed with the stem in the horizontal position.

C. Valves shall be installed in accordance with the manufacturer's recommendations.

D. Control valves shall be installed so that they are accessible and serviceable and so that actuators may be serviced and removed without interference from structure or other pipes and/or equipment.

E. Isolation valves shall be installed so that the control valve body may be serviced without draining the supply/return side piping system. Unions shall be installed at all connections to screw-type control valves.

F. Provide tags for all control valves indicating service and number. Tags shall be brass, 1-1/2 inch in diameter, with 1/4 inch high letters. Securely fasten with chain and hook. Match identification numbers as shown on approved controls shop drawings.

3.13 CONTROL DAMPER INSTALLATION

A. Damper submittals shall be coordinated for type, quantity, and size to ensure compatibility with sheet metal design.

B. Duct openings shall be free of any obstruction or irregularities that might interfere with blade or linkage rotation or actuator mounting. Duct openings shall measure 1/4 inch larger than damper dimensions and shall be square, straight, and level.

C. Individual damper sections, as well as entire multiple section assemblies, must be completely square and free from racking, twisting, or bending. Measure diagonally from upper corners to opposite lower corners of each damper section. Both dimensions must be within 0.3 cm (1/8 in.) of each other.

D. Follow the manufacturer's instructions for field installation of control dampers. Unless specifically designed for vertical blade application, dampers must be mounted with blade axis horizontal.

E. Install extended shaft or jackshaft according to manufacturer’s instructions. (Typically, a sticker on the damper face shows recommended extended shaft location. Attach shaft on labeled side of damper to that blade.)

F. Damper blades, axles, and linkage must operate without binding. Before system operation, cycle damper after installation to ensure proper operation. On multiple section assemblies, all sections must open and close simultaneously.

G. Provide a visible and accessible indication of damper position on the drive shaft end.

H. Support ductwork in area of damper when required to prevent sagging due to damper weight.

I. After installation of low-leakage dampers with seals, caulk between frame and duct or opening to prevent leakage around perimeter of damper.

3.14 PACKAGED EQUIPMENT CONTROLS

A. General: The electronic controls packaged with any equipment furnished under this contract shall communicate with the building direct digital control (DDC) system. The DDC system shall communicate with these controls to read the information and change the control setpoints as shown in the points list, sequences of operation, and control schematics. The information to be communicated between the DDC system and these controls shall be in the standard object format as defined in ANSI/ASHRAE Standard 135 (BACnet). Controllers shall communicate with other BACnet objects on the internetwork using the Read (Execute) Property service as defined in Clause 15.5 of Standard 135.

B. Distributed Processing: The controller shall be capable of stand-alone operation and shall continue to provide control functions if the network connection is lost.

C. I/O Capacity: The controller shall contain sufficient I/ O capacity to control the target system.

D. The Controller shall have a physical connection for a laptop computer or a portable operator’s tool.

E. Environment: The hardware shall be suitable for the anticipated ambient conditions.

1. Controllers used outdoors and/or in wet ambient conditions shall be mounted within waterproof enclosures and shall be rated for operation at 40°C to 60°C (40°F to 140°F).

2. Controllers used in conditioned space shall be mounted in dust-proof enclosures and shall be rated for operation at 0°C to 50°C (32°F to 120°F).

F. Serviceability: Provide diagnostic LEDs for power, communication, and processor. All wiring connections shall be made to field removable, modular terminal strips or to a termination card connected by a ribbon cable.

G. Memory: The Controller shall maintain all BIOS and programming information in the event of a power loss for at least 30 days.

H. Power: Controller shall be able to operate at 90% to 110% of nominal voltage rating.

I. Transformer: Power supply for the Controller must be rated at minimum of 125% of ASC power consumption and shall be fused or current limiting type.

3.15 WARNING LABELS

A. Permanent warning labels shall be affixed to all equipment that can be automatically started by the control system.

1. Labels shall use white lettering (12-point type or larger) on a red background.

2. Warning labels shall read as follows:

3. **C A U T I O N**
This equipment is operating under automatic control and may start or stop at any time without warning. Switch disconnect to "Off" position before servicing.

B. Permanent warning labels shall be affixed to all motor starters and control panels that are connected to multiple power sources utilizing separate disconnects.

1. Labels shall use white lettering (12-point type or larger) on a red background.

2. Warning labels shall read as follows:

3. **C A U T I O N**
This equipment is fed from more than one power source with separate disconnects. Disconnect all power sources before servicing.

3.16 IDENTIFICATION OF HARDWARE AND WIRING

A. All wiring and cabling, including that within factory-fabricated panels shall be labeled at each end within 5 cm (2 in.) of termination with control system address or termination number.

B. All pneumatic tubing shall be labeled at each end within 5 cm (2 in.) of termination with a descriptive identifier.

C. Permanently label or code each point of field terminal strips to show the instrument or item served.

D. Identify control panels with minimum 1 cm (½ in.) letters on laminated plastic nameplates.

E. Identify all other control components with permanent labels. All plug-in components shall be labeled such that label removal of the component does not remove the label.

F. Identify room sensors related to terminal boxes or valves with nameplates.

G. Manufacturers' nameplates and UL or CSA labels shall be visible and legible after equipment is installed.

H. Identifiers shall match record documents.

3.17 CONTROLLERS

A. Provide a separate controller for each HVAC system. A DDC controller may control more than one system provided that all points associated with the system are assigned to the same DDC controller. Points used for control loop reset, such as outside air or space temperature, are exempt from this requirement.

B. Building Controllers and Custom Application Controllers shall be selected to provide the required I/O point capacity required to monitor all of the hardware points.

3.18 PROGRAMMING

A. Provide sufficient internal memory for the specified sequences of operation and trend logging.

B. Point Naming: Name points as shown on the equipment points list provided with each sequence of operation. If character limitations or space restrictions make it advisable to shorten the name, provide a list of abbreviations in the submittals. Where multiple points with the same name reside in the same controller, each point name may be customized with its associated Program Object number. For example, "Zone Temp 1" for Zone 1, "Zone Temp 2" for Zone 2.

C. Software Programming:

1. Provide programming for the system and adhere to the sequences of operation provided. All other system programming necessary for the operation of the system, but not specified in this document, also shall be provided by the contractor. Embed into the control program sufficient comment statements to clearly describe each section of the program. The comment statements shall reflect the language used in the sequences of operation. Use the appropriate technique based on the following programming types:

a. Text-based:

1) Must provide actions for all possible situations.
2) Must be modular and structured.
3) Must be commented.

b. Graphic-based:

1) Must provide actions for all possible situations.
2) Must be documented.

c. Parameter-based:

1) Must provide actions for all possible situations.
2) Must be documented.

D. Operator Interface:

1. Standard Graphics. Provide graphics for all mechanical systems and floor plans of the building. This includes each chilled water system, hot water system, chiller, boiler, air handler, and all terminal equipment. Point information on the graphic displays shall dynamically update. Show on each graphic all relevant input and output points for that equipment. Also show relevant calculated points such as setpoints. As a minimum, show on each equipment graphic the input and output points and relevant calculated points as indicated on the drawings.

2. The contractor shall provide all the labor necessary to install, initialize, start up, and troubleshoot all operator interface software and its functions as described in this section. This includes any operating system software, the operator interface database, and any third-party software installation and integration required for successful operation of the operator interface.

3.19 CONTROL SYSTEM CHECKOUT AND TESTING

A. Startup Testing. All testing listed in this article shall be performed by the contractor and shall make up part of the necessary verification of an operating control system. This testing shall be completed before the owner’s representative is notified of the system demonstration.

1. The contractor shall furnish all labor and test apparatus required to calibrate and prepare for service of all instruments, controls, and accessory equipment furnished under this specification.

2. Verify that all control wiring is properly connected and free of all shorts and ground faults. Verify that terminations are tight.
3. Enable the control systems and verify calibration of all input devices individually. Perform calibration procedures according to manufacturers' recommendations.
4. Verify that all binary output devices (relays, solenoid valves, two-position actuators and control valves, magnetic starters, etc.) operate properly and that the normal positions are correct.
5. Verify that all analog output devices (I/Ps, actuators, etc.) are functional, that start and span are correct, and that direction and normal positions are correct. The contractor shall check all control valves and automatic dampers to ensure proper action and closure. The contractor shall make any necessary adjustments to valve stem and damper blade travel.
6. Verify that the system operation adheres to the sequences of operation. Simulate and observe all modes of operation by overriding and varying inputs and schedules. Tune all DDC loops.
7. Alarms and Interlocks:
    a. Check each alarm separately by including an appropriate signal at a value that will trip the alarm.
    b. Interlocks shall be tripped using field contacts to check the logic, as well as to ensure that the fail-safe condition for all actuators is in the proper direction.
    c. Interlock actions shall be tested by simulating alarm conditions to check the initiating value of the variable and interlock action

3.20 CLEANING

A. The contractor shall clean up all debris resulting from his/her activities daily. The contractor shall remove all cartons, containers, crates, etc., under his/her control as soon as their contents have been removed. Waste shall be collected and placed in a designated location.

B. At the completion of work in any area, the contractor shall clean all work, equipment, etc., keeping it free from dust, dirt, and debris, etc.

C. At the completion of work, all equipment furnished under this section shall be checked for paint damage, and any factory-finished paint that has been damaged shall be repaired to match the adjacent areas. Any cabinet or enclosure that has been deformed shall be replaced with new material and repainted to match the adjacent areas.

3.21 MANUFACTURER'S FIELD SERVICES

A. Start and commission systems. Allow sufficient time for start-up and commissioning prior to placing control systems in permanent operation.

B. Start up, check out, and test all hardware and software and verify communication between all components.
    1. Verify that all control wiring is properly connected and free of all shorts and ground faults. Verify that terminations are tight.
    2. Verify that all analog and binary input/output points read properly.
    3. Verify alarms and interlocks.
    4. Verify operation of the integrated system

C. Provide basic operator training for 2 persons on data display, alarm and status descriptors, requesting data, execution of commands and request of logs. Include a minimum of 8 hours dedicated instructor time. Provide training on site. Training shall take place at the project site during the normal work hours of 8 a.m. to 5 p.m. weekdays. Training shall include:

1. Explanation of drawings, operations and maintenance manuals.
2. Walk-through of the job to locate control components.
3. Operator workstation and peripherals.
4. DDC custom application controllers, ASC, TEC, SAC operation and function.
5. Operator control functions including graphic generation and field panel programming.
6. Explanation of adjustment, calibration and replacement procedures.
7. More detailed training listed below.

3.22 SERVICE AND GUARANTEE

A. General Requirements: Provide all services, materials and equipment necessary for the successful operation of the entire BAS System for a period of one year after completion of successful performance test. Provide necessary material required for the work. Minimize impacts on facility operations when performing scheduled adjustments and non-scheduled work.

B. Description of Work: The adjustment and repair of the system includes all computer equipment, software updates, transmission equipment and all sensors and control devices. Provide the manufacturer's required adjustment and all other work necessary.

C. Personnel: Provide qualified personnel to accomplish all work promptly and satisfactorily. Owner shall be advised in writing of the name of the designated service representative, and of any changes in personnel.

D. Emergency Service: Owner shall initiate service calls when the system is not functioning properly. Qualified personnel shall be available to provide service to the complete system. Furnish Owner with a telephone number where service representative can be reached at all times. Service personnel shall be at the site within 4 hours after receiving a request for service. Restore the control system to proper operating condition within 24 hours.

E. Operation: Performance of scheduled adjustment and repair shall verify operation of the system as demonstrated by the initial performance test.

F. Systems Modifications: Provide any recommendations for system modification in writing to Owner. Do not make any system modifications, including operating parameters and control settings, without prior approval of Owner. Any modifications made to the system shall be incorporated into the operations and maintenance manuals, and other documentation affected.

G. Software: Provide all software updates and verify operation in the system. These updates shall be accomplished in a timely manner, fully coordinated with the system operators, and shall be incorporated into the operations and maintenance manuals, and software documentation.

3.23 PREPARATION FOR BALANCING

A. Check the calibration and setpoints of all controllers.

B. Check the locations of all thermostats and humidistats for potential erratic operation from outside influences such as sunlight, drafts, or cold walls.

C. Check that all sequences operate as specified. Verify that no simultaneous heating and cooling occurs, unless specified. Observe that heating cannot begin at TAB reheat terminals until the unit is at the minimum airflow.

D. Verify the operation of all interlock systems.

3.24 TEST AND BALANCE COORDINATION

A. The Contractor shall furnish a single set of all tools necessary to interface to the control system for test and balance purposes.

B. In addition, the Contractor shall provide a qualified technician to assist in the test and balance process until the first 20 terminal units are balanced.

C. The tools used during the test and balance process shall be returned at the completion of the testing and balancing.

3.25 CONTROL SYSTEM DEMONSTRATION AND ACCEPTANCE

A. Demonstration:

1. Prior to acceptance, the control system shall undergo a series of performance tests to verify operation and compliance with this specification. These tests shall occur after the Contractor has completed the installation, started up the system, and performed his/her own tests.
2. The tests described in this section are to be performed in addition to the tests that the contractor performs as a necessary part of the installation, start-up, and debugging process and as specified in the "Control System Checkout and Testing" article in Part 3 of this specification. The engineer may be present to observe and review these tests. The engineer shall be notified at least 10 days in advance of the start of the testing procedures.
3. The demonstration process shall follow that approved in Part 1, "Submittals." The approved checklists and forms shall be completed for all systems as part of the demonstration.
4. The contractor shall provide at least two persons equipped with two-way communication and shall demonstrate actual field operation of each control and sensing point for all modes of operation including day, night, occupied, unoccupied, fire/smoke alarm, seasonal changeover, and power failure modes. The purpose is to demonstrate the calibration, response, and action of every point and system. Any test equipment required to prove the proper operation shall be provided by and operated by the contractor.
5. As each control input and output is checked, a log shall be completed showing the date, technician’s initials, and any corrective action taken or needed.
6. Demonstrate compliance with Part 1, "System Performance."
7. Demonstrate compliance with sequences of operation through all modes of operation.
8. Demonstrate complete operation of operator interface.
9. Additionally, the following items shall be demonstrated:

a. DDC loop response. The contractor shall supply trend data output in a graphical form showing the step response of each DDC loop. The test shall show the loop's response to a change in set point, which represents a change of actuator position of at least 25% of its full range. The sampling rate of the trend shall be from 10 seconds to 3 minutes, depending on the speed of the loop. The trend data shall show for each sample the set point, actuator position, and controlled variable values. Any loop that yields unreasonably under-damped or over-damped control shall require further tuning by the Contractor.

b. Demand limiting. The contractor shall supply a trend data output showing the action of the demand limiting algorithm. The data shall document the action on a minute-by-minute basis over at least a 30-minute period. Included in the trend shall be building kW, demand limiting set point, and the status of sheddable equipment outputs.

c. Optimum start/stop. The contractor shall supply a trend data output showing the capability of the algorithm. The change-of-value or change-of-state trends shall include the output status of all optimally started and stopped equipment, as well as temperature sensor inputs of affected areas.

d. Interface to the building fire alarm system.

e. Operational logs for each system that indicate all set points, operating points, valve positions, mode, and equipment status shall be submitted to the architect/engineer. These logs shall cover three 48-hour periods and have a sample frequency of not more than 10 minutes. The logs shall be provided in both printed and disk formats.

10. Any tests that fail to demonstrate the operation of the system shall be repeated at a later date. The contractor shall be responsible for any necessary repairs or revisions to the hardware or software to successfully complete all tests.

B. Acceptance:

1. All tests described in this specification shall have been performed to the satisfaction of both the engineer and owner prior to the acceptance of the control system as meeting the requirements of completion. Any tests that cannot be performed due to circumstances beyond the control of the contractor may be exempt from the completion requirements if stated as such in writing by the engineer. Such tests shall then be performed as part of the warranty.

2. The system shall not be accepted until all forms and checklists completed as part of the demonstration are submitted and approved as required in Division 01.

END OF SECTION

SECTION 23 1123
FACILITY NATURAL GAS PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Provide equipment, materials, tools, labor, and supervision necessary to furnish, fabricate, and install a complete Natural Gas piping system.

1.2 STANDARDS AND CODES

A. Pipe materials specified in this Section shall apply to technical sections of Division 23 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. Gas piping and connections to equipment shall be in accordance with NFPA-54 and the local utility company.

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. Submit piping schedule listing each pipe material used and systems served.

PART 2 PRODUCTS

2.1 MATERIAL

A. Aboveground natural gas.

1. Black steel pipe seamless, Schedule 40, ASTM A53.

B. Gas piping underground, 5'-0" outside of building, to 59 psig operating pressure.

1. Polyethylene plastic pipe and fittings, medium density ASTM D2513, 1248 and 3350. Resin classified as Type II, Class B, Category 5, Grade P24. Cell classified as PE 235333 E or PE 234333E. Verify requirements with local utility.

C. Gas vents and underground gas piping within 5'-0" of building.

1. Welded black steel Schedule 40, coated with asphalt and wrapped, ASTM A120.

D. Fittings:

1. Threaded pipe - malleable iron fittings, 125-pound standard flat band water pattern.

2. Welded pipe - welded neck fittings and welded neck flanges, same material and strength as pipe.
3. Carbon steel pipe - material and strength shall correspond to pipe specifications. ANSI B31.5.
4. Plastic underground natural gas piping - all fittings shall be manufactured (tee's, elbows, reducers and transitions to steel pipe), by the piping manufacturer.

E. 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 of 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 under 2" diameter shall be screwed. Pipe 2" diameter and over shall be welded.
3. Plastic underground natural gas piping - butt fusion welded in accordance with manufacturers recommendations.

F. Nipples and Unions:

1. 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.
2. 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.
3. Dielectric unions shall be installed between connections of copper pipe and ferrous piping.

2.2 PLUG VALVES

A. Plug valves shall not be furnished unless specifically shown on the Drawings. When so indicated, this type of valve shall meet the following specifications:

1. Smaller than 2 in.: Tapered plug valves, semi-steel, screwed, wrench operated with wrench.
2. 2 in. and larger: Tapered plug valves, carbon steel, flanged, lubricated plug wrench operated with a wrench.

2.3 GAS VALVES

A. Ball valves rated for natural gas service:

1. Construction: ASME B16.44, brass, bronze, or ductile iron body, 304 stainless steel or chrome plated brass ball, Teflon seats, blow out proof stem, lever handle, rated to 600 psi CWP.

2.4 PRESSURE REGULATING VALVE (NATURAL GAS)

A. Gas regulators shall be furnished and installed to maintain the gas pressure to the pilot supply and main burner supply line within +10% of the operating pressure from maximum to minimum firing rates at inlet operating pressures of 1-1/2 to 2 psig.

B. Regulators shall be of the spring-loaded or pressure balanced type. Under no circumstances shall a dead weight or a weight and level type of regulator be used.

C. Gas regulators shall be suitable for operation with electronic ignition “dead end” conditions.

D. Gas pressure regulators shall be AGA and CGA certified for scheduled operating conditions.

2.5 MECHANICAL SLEEVE SEALS

A. Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve, connected with bolts and pressure plates which cause rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install piping and make service connection as shown on the Drawings.

B. Pipe size 2 in. and larger or 2 psig and greater shall have welded joints; pipe less than 2 in. and less than 2 psig shall have threaded joints made up with gas resistant joint compound.

C. Install gas shutoff plug valve in main, in each branch line and at each appliance.

D. Install service plug valve at each outlet.

E. General: Comply with requirements of basic piping material sections for installation of piping materials. Install piping products in accordance with manufacturer's written instructions, with applicable installation requirements of ANSI Z 223.l, and in accordance with recognized industry practices to insure that products serve intended functions.

F. Use sealants on metal gas piping threads that are chemically resistant to LP and natural gas. Use sealants sparingly and apply to only male threads of metal joints.

G. Remove cutting and threading burrs before assembling piping.

H. Do not install defective piping or fittings. Do not use pipe with threads that are chipped, stripped or damaged.

I. Plug each gas outlet, including valves, with a threaded plug or cap immediately after installation, and retain until continuing piping or equipment connections are completed.

J. Install dirt-legs in gas piping at connections to equipment and elsewhere as indicated, and where required by code or regulation.

K. Install tee fittings with bottom outlet plugged, or capped, at bottom of pipe risers.

L. Do not install gas piping through foundations or under buildings. Where unavoidable, install in welded conduit, ventilated to outdoors on both ends, and tested to same requirements as gas piping.

M. Gas piping shall be electrically grounded and continuously grounded within the project, and bonded tightly to the grounding connection.

N. Use dielectric unions where dissimilar metals are joined together.

O. Install piping with 1/64" per foot (1/8%) downward slope in direction flow.

P. Install piping parallel to other piping, but maintain minimum of 12" clearance between gas piping and steam or hydronic piping above 200° F (93° C).

Q. Gas Service:

1. General: Arrange with utility company to provide gas service to indicated location with shutoff at terminus. Consult with utility as to extent of its work, costs, fees and permits involved. Pay such costs and fees; obtain permits.
2. Extend service pipe from utility's terminus to inside building wall, under utility's direction.
3. Provide shutoff outside building where indicated. Provide shutoff in gas service pipe at entry in building.

R. Installation of Valves:

1. Gas Cocks: Provide at connection to gas train for each gas-fired equipment item; and on risers and braces where indicated.
2. Locate gas cocks where easily accessible, and where they will be protected from possible injury.
3. Control Valves: Install as indicated. Refer to Division 16 for wiring, not work of this section.
4. Pressure Regulating Valves: Install where shown and where required; comply with Utility requirements. Pipe atmospheric vent to outdoors, full size of outlet. Install gas shutoffvalve upstream of each pressure regulating valve.

3.2 PAINTING

A. Paint exterior metal piping, valves, service regulators, service meters, and piping specialties, except components, with factory-applied paint or protective coating.

1. Alkyd System: MPI EXT 5.1D.
   a. Prime Coat: Alkyd anticorrosive metal primer.
   b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
   c. Topcoat: Exterior alkyd enamel.
   d. Color: Gray.

3.3 MECHANICAL SLEEVE SEAL INSTALLATION

A. Install mechanical sleeve seals at all pipe penetrations through exterior walls.

B. Loosely assemble rubber links around pipe and bolts and pressure plates located under each bolt head and nut. Push into sleeve and center. Tighten bolts until links have expanded to form watertight seal.

3.4 EQUIPMENT CONNECTIONS

A. Fuel Gas Piping Tightness Test: Prior to initial operation, test and purge fuel gas piping in accordance with ANSI Z 223.I, National Fuel Gas Code.

B. General: Connect gas piping to each gas-fired equipment item, with dirt leg and shutoff gas cock and pressure regulator where required. Comply with equipment manufacturer's instructions.

C. Piping Tests:

1. Using dry nitrogen, purge each segment to be tested. Cap or otherwise seal the segment to be tested. Fill system with dry nitrogen and test in accordance with NFPA 54.
2. Repair or replace fuel gas piping as required to eliminate leaks, and retest as specified to demonstrate compliance.
3. All welded pipe shall be pressure tested to 90 psig for a minimum period of one hour. Submit test results.

D. Purge System:

1. After all segments have been tested and entire system completed, purge the system free of air in accordance with NFPA 54. Do not leave purge discharge points unattended.

E. Spare Parts:

1. Furnish to Owner, with receipt, 2 valve wrenches for each type of gas valve installed, requiring same.

END OF SECTION

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SECTION 23 3113
METAL DUCTS

PART 1 GENERAL

1.1 SUMMARY

A. Provide material, devices, labor, and supervision necessary to fabricate and erect ductwork as required by the Drawings and this Section.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instructions for metal ductwork materials and products.

B. Shop Drawings: Submit ductwork shop drawings for entire facility, to scale, double line, indicating duct sizes, locations, fittings, equipment, accessories, structural clearances, etc. Do not install ductwork prior to approval of shop drawings by Engineer.

C. Duct Leakage Test Reports: Submit test report to Engineer and include in O&Ms. Indicate sections tested, test pressure, leakage rate and highlight duct sections that were tested.

1.3 QUALITY ASSURANCE

A. Codes and Standards:

1. 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 Section VII, of the SMACNA "HVAC Duct Construction Standards Metal and Flexible" Current Edition. This shall be subsequently referred to as the SMACNA Manual. All ductwork must comply with all local, state and federal code requirements.

2. Comply with applicable requirements of NFPA 91.

1.4 DESCRIPTION

A. Air ducts shall be constructed as follows:

1. Supply downstream of VAV Boxes, Return, and Exhaust Ductwork: ±2” w-g.

2. Supply upstream of VAV Boxes: ±3” w-g.

PART 2 PRODUCTS

2.1 GENERAL

A. Shop fabricated sheet metal work shall be constructed of prime quality resquared tight coat galvanized steel, except where other type material is specified. Manufacturer's name and U.S. gauge number shall appear on each sheet.

B. Duct sealant shall be installed per SMACNA Class A-all transverse joints, longitudinal seams and duct wall penetrations.

C. Duct Sealant for Low Pressure Duct: UL labeled non-hardening, non-migrating mastic or liquid elastic sealant, type applicable for fabrication/installation detail, as compounded and recommended by manufacturer specifically for sealing joints and seams in ductwork. Sealant to be Mastic No. IG601 as manufactured by Hardcast or Engineer approved equivalent product manufactured by Ductmate, United McGill, or Engineer Pre-Approved Equivalent.

D. Round and/or oval ducts and fittings shall be as manufactured by Semco, United McGill, or Engineer Pre-Approved Equivalent.

2.2 DUCT

A. Rectangular Duct:

1. Sheet Metal: Except as otherwise indicated, fabricate ductwork from minimum 24 gage (Minimum 24 gage even if SMACNA allows thinner) galvanized sheet steel complying with ASTM A527, lockforming quality; with G90 zinc coating in accordance with ASTM A653; and mill phosphatized for exposed locations.
2. Rectangular duct shall be fabricated to the SMACNA functional criteria for the pressure class indicated on the Drawings/Specs.
3. Pittsburgh lock shall be used on all longitudinal seams. All longitudinal seams will be sealed with mastic sealant. Snaplock is not acceptable.
4. Stainless Steel Sheet: Where indicated, provide minimum 18 gage stainless steel complying with ASTM A167; Type 302, 304, or 316; with No. 4 finish where exposed to view in occupied spaces, No. 1 finish elsewhere. Protect finished surfaces with mill-applied adhesive protective paper, maintained through fabrication and installation.
5. Rectangular Duct Fittings:
    a. Elbows shall be constructed with centerline radius of not less than 1.5 times duct width; where space conditions will not permit this radius or where indicated on the Drawings, square elbows with single thickness streamline turning vanes shall be used. Provide trailing edge extension for elbows in series.
    b. Slopes for transitions or other changes in dimension shall be minimum 1 to 3.
    c. All duct seams and joints shall be sealed to SMACNA Class A requirements.
    d. Rectangular branch taps from mains shall be 45° entry fittings.

B. Round/Oval Duct:

1. Round Duct shall be spiral lock seam type, fabricated of galvanized steel strip with airtight four-ply lock seams. Minimum 24 gage (and with G90 zinc coating in accordance with ASTM A653) even if SMACNA allows thinner.
2. Metal gauges shall be as listed in the SMACNA Standard for the pressure class indicated on the Drawings/Specs.
3. Round duct shall be externally insulated.
4. Round/Oval Fittings:
    a. Elbows for round ducts shall have a center line radius of 1.5 times the duct diameter.
    b. 45° and 90° elbows for ducts up to 8" diameter shall be die stamped two-piece with welded longitudinal seams.

c. Elbows for round ducts over 8" diameter shall be formed of segments with welded seams and following numbers of segments:

1) 90 degree elbow: 5 segments
2) 60 degree elbow: 3 segments
3) 45 degree elbow: 3 segments
4) 30 degree elbow: 2 segments
5) 22½ degree elbow: 2 segments

d. Tees, crosses and lateral cross fittings for round duct shall be of the conical type.

e. Reducers, increasers, offsets, wyes, crosses, divided flow fittings and similar fittings for round and oval duct shall be one-piece construction with welded seams.

f. Metal gauges for fittings for round duct shall be as listed in SMACNA Standard for the pressure class indicated above.

g. Duct and fitting welds shall be painted after fabrication to prevent corrosion where zinc has been burned by welding.

h. No bull headed tees shall be used.

i. Pipe-to-pipe joints for round and oval ducts up to 50" diameter shall be made with male sleeve couplings reinforced by rolled bead.

j. Pipe-to-fitting joints for round and oval ducts up to 50" shall be made by slip-fit of projecting collar of fitting into the duct.

k. Slip-fit joints shall be fastened with sheet metal screws, place ½" from fitting or coupling head.

l. Joints shall be sealed with duct sealant installed as recommended by the manufacturer.

m. Duct reinforcing, size of reinforcing angles and spacing shall be as recommended by SMACNA.

C. Exterior Double Wall Insulated Rectangular Ducts: 22 gauge embossed aluminum cassing the inner and outer layers of minimum R-24 closed phenolic insulation.

1. Manufacturer in accordance with SMACNA (DCS)
2. SMACNA Class 3 Air Leakage or better at 3 "wc
3. SMACNA Seal Class A
4. Pittsburgh Seams with TDC Joints
5. Snow diverter for horizontal sections of duct
6. Kynar 500 finish
   a. Color: To be selected by architect from standard colors during the submittal process
7. Manufacturers:
   a. Ducts & Cleats Pro-R
   b. Engineer Pre-Approved Equivalent

2.3 PLENUMS

A. Plenums shall be fabricated of same material as duct connecting to plenum and shall be two metal gauges heavier than gauge of largest duct connecting to plenum. Plenums used for connecting to exterior louvers shall have all seams welded watertight at the floor and 6 inches up the wall. In addition, plenums used for connection to exterior intake louvers shall have the floors sloped to a drain pipe connection and the drain piped to the nearest floor drain.

2.4 DUCTWORK SUPPORT MATERIALS

A. Except as otherwise indicated, provide hot-dipped galvanized steel fasteners, anchors, rods, straps, trim and angles for support of ductwork.

2.5 DUCT ACCESSORIES

A. Transverse Duct Joints: May be made with the Ductmate Systems or an Engineer approved equivalent. The Ductmate Systems are to be used in accordance with the Ductmate factory installation and assembly instructions.

1. Ductmate 440 or a Butyl Rubber Gasket which meets Mil-C 18969B, Type II Class B, T-C-1796 A, Type II Class B, and TTS-S-001657 must also pass UL-723. This material, in addition to the above, shall not contain vegetable oils, fish oils, or any other type vehicle that will support fungal and/or bacterial growth associated with dark, damp areas of ductwork. The recommended test procedure for bacterial and fungal growth is found in 21CFR 177, 1210 closures with sealing gaskets for food containers.
2. Ductmate or W.D.C.I. proprietary duct connection systems are acceptable. Duct constructed using these systems shall refer to the manufacturer's guidelines for sheet gauge, intermediate reinforcement size and spacing, and joint reinforcements.
3. Formed on flanges (T.D.C./T.D.F./T-25A/T-25B) are acceptable. Formed on flanges shall be constructed as SMACNA T-25 flanges, whose limits are defined on Page 1.36 1985 SMACNA Manual, First Edition. No other construction pertaining to formed on flanges will be accepted. Formed on flanges shall be accepted for use on ductwork 42" wide or less, 2" static positive pressure or less, and shall include the use of corners, bolts and cleat. (Over 42", the reinforcement/joint deflection criteria no longer conform to the UMC).

PART 3 EXECUTION

3.1 INSTALLATION

A. General: Assemble and install ductwork in accordance with recognized industry practices which will achieve airtight (5% leakage for systems rated 3" and under; 1% for systems rated over 3") and noiseless (no objectionable noise) systems, capable of performing each indicated service. Install each run with minimum number of joints. Align ductwork accurately at connections, within 1/8" misalignment tolerance and with internal surfaces smooth. Support ducts rigidly with suitable ties, braces, hangers and anchors of type which will hold ducts true-to-shape and to prevent buckling. Support vertical ducts at every floor.

B. Inserts: Install concrete inserts for support of ductwork in coordination with form work, as required to avoid delays in work.

C. Field Fabrication: Complete fabrication of work at project as necessary to match shop-fabricated work and accommodate installation requirements.

D. Locate ductwork runs, except as otherwise indicated, vertically and horizontally and avoid diagonal runs wherever possible. Locate runs as indicated by diagrams, details and notations or, if not otherwise indicated, run ductwork in shortest route which does not obstruct usable space or block access for servicing building and its equipment. Install offsets, angles, and transitions as may be required to avoid interferences with other work, install streamlined easements around obstructions where necessary to pass obstructions through ducts. Maintain full capacity of ducts at offsets, angles, transitions and easements, except where Drawings indicated use of reducing or increasing transitions. Hold ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

E. Limit clearance to ½" where furring is shown for enclosure or concealment of ducts, but allow for insulation thickness, if any. Where possible, locate insulated ductwork for 1" clearance outside of insulation. Wherever possible in finished and occupied spaces, conceal ductwork from view, by locating in mechanical shafts, hollow wall construction or above suspended ceilings. Do not encase horizontal runs in solid partitions, except as specifically shown. Coordinate layout with suspended ceiling and lighting layouts and similar finished work.

F. Where ducts pass through interior partitions and exterior walls, conceal the space between the construction opening and the duct or duct-plus-insulation with sheet metal flanges of the same gauge as the duct. Overlap the opening on all sides by at least 1½".

G. Coordinate duct installations with installation of accessories, equipment, controls and other associated work of the ductwork system.

H. Each duct section shall be rigidly supported from structure. Attach hangers to structure with expansion plugs, concrete inserts, beam clamps or other approved means. Rubber-in-shear isolators shall be installed in hangers for ducts in equipment rooms, to prevent vibration transmission to the structure.

I. Install as indicated on the Drawings duct mounted equipment as specified in other Sections.

J. Duct sizes shown on Drawings are net inside dimensions. Increase duct sizes as required to allow for installation of duct liner, where specified.

K. Application of Duct Sealant: All ducts to be properly sealed. Specified duct sealant to be pumped or painted into all joints and seams on all ductwork systems. Sealant shall be allowed to set 48 hours before any air pressure is applied to system.

L. Electrical Equipment Spaces: Do not route ductwork through electrical equipment spaces and enclosures. Do not run ductwork above electrical panels.

3.2 EQUIPMENT CONNECTIONS

A. General: Connect metal ductwork to equipment as indicated; provide flexible connection for each ductwork connection to equipment mounted on vibration isolators, and/or equipment containing rotating machinery.

3.3 ADJUSTING AND CLEANING

A. Clean ductwork internally, unit by unit as it is installed, of dust and debris. Clean external surfaces of foreign substances which might cause corrosive deterioration of metal or, where ductwork is to be painted, might interfere with painting or cause paint deterioration.

B. Temporary Closure: At ends of ducts which are not connected to equipment or air distribution devices at time of ductwork installation, provide temporary closure of polyethylene film or other covering which will prevent entrance of dust and debris until time connections are to be completed.

C. Balancing: Refer to Section 23 0593, "Testing, Adjusting and Balancing for HVAC" for air distribution balancing of metal ductwork; not work of this section. Seal any leaks in ductwork that become apparent during the balancing process.

3.4 DUCTWORK LEAKAGE TESTING

A. All exterior ductwork shall be pressure tested.

B. Major supply and exhaust ductwork serving AHUs shall be pressure tested before branch ducts are added or ceilings enclose ductwork.

C. Pressure test requirements shall meet or exceed IECC.

D. Installed ductwork shall be tested prior to installation of access doors, take-offs, etc, and before duct is made inaccessible.

E. Negative pressure systems may be tested with positive pressure tests.

F. The maximum permissible duct leakage class of the tested duct shall be CL-4 as determined in accordance with IECC.

G. The testing shall be performed as follows:

1. Perform testing in accordance with the SMACNA HVAC Air Duct Leakage Test Manual.
2. Use a certified orifice tube for measuring the leakage.
3. Define section of system to be tested and blank off.
4. Determine the percentage of the system being tested.
5. Using that percentage, determine the allowable leakage (cfm) for that section being tested.
6. Pressurize to operating pressure and repair any significant or audible leaks.
7. Repressurize and measure leakage.
8. Repeat steps 6 and 7 until the leakage measured is less than the allowable defined in Step 5.

END OF SECTION

SECTION 23 3300
AIR DUCT ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Volume dampers.
2. Motorized control dampers.
3. Fire dampers.
4. Turning vanes.
5. Duct-mounting access doors.
6. Flexible connectors.
7. Flexible ducts.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instructions for metal ductwork materials and products for the following:

1. Volume dampers.
2. Motorized control dampers.
3. Fire dampers.
4. Turning vanes.
5. Duct-mounting access doors.
6. Flexible connectors.
7. Flexible ducts.

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. Fire, Smoke, and Combination Dampers:
   a. Constructed and tested in accordance with UL Safety Standard 555 and 555S, for 1 1/2 hour fire protection rating, with 165oF fusible link, and shall bear UL label.
3. 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.
4. Comply with applicable requirements of NFPA 91.

PART 2 PRODUCTS

2.1 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 or engineer pre-approved equivalent.

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 or engineer pre-approved equivalent.

2.2 MOTORIZED CONTROL DAMPERS

A. See section 23 0923 Direct Digital Controls System For HVAC for motorized control damper specifications.

2.3 FIRE DAMPERS

A. Manufacturers:

1. Ruskin Manufacturing Company, Air Balance, Prefco or Pottorf or Engineer Pre-Approved equivalent.
2. Design, specification and model numbers based on Ruskin Manufacturing Company.

B. Materials

1. Fire dampers shall be of the Class II dynamic rated curtain type, suitable for either vertical or horizontal installation, with 20 gauge steel channel frames, 24 gauge steel blades, and 18 gauges steel enclosure with duct collars. All parts galvanized mill finish.
2. Fire dampers shall be Type D-IBD2 of the following style enclosures:

a. Style B or C; for square and rectangular ducts.

C. Provide thin-line type fire dampers in all transfer grilles and sidewall grilles installed in fire rated walls. Provide with maximum 2" frames, Type IB DT2.

2.4 TURNING VANES

A. Manufacturers:

1. Aero Dyne; Ductmate; Anemostat; Barber Coleman; Duro Dyne; Hart & Cooley, or Engiener Pre-Approved Equivalent.

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.

2.5 DUCT-MOUNTING ACCESS DOORS

A. General:

1. Shall be of same material as ducts in which they are installed, fabricated of two thicknesses of not less than 22 gauge, with 1" thick rigid glass fiber filler. Provide sheet metal frame, airtight gasket and two cam latches. Access doors and panels shall be 2 inches smaller than duct width and square for ducts 18” wide and larger, maximum size shall be 24" x 24" unless noted otherwise. For ducts less than 18” wide, access doors and panels shall be 2” smaller than duct width and 18” long. Pre-manufactured doors shall be hinged and shall be of adequate size to allow easy access to hardware which needs to be maintained.

2.6 FLEXIBLE DUCT CONNECTIONS

A. Manufacturers:

1. Ventfabric, Inc., Ventglass, Duro Dyne, Ductmate, American/Elgin, or Engineer Pre-Approved Equivalent.

B. General:

1. 30 ounce woven glass fiber, double neoprene coated, fire retardant, waterproof and airtight, suitable for temperatures to 200o F, UL approved.

2.7 FLEXIBLE DUCTS

A. Manufacturers:

1. Flexible duct shall be by Thermaflex, Semco, Wiremold, or Engineer Pre-Approved Equivalent.

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 6.0

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 10" wg for nominal sizes 4 thru 12 inch and 16" wg for nominal sizes 14 thru 16 inch, and a negative pressure rating of 1" wg for sizes 4 thru 12 inches. Duct shall be rated for a velocity of 5,000 feet per minute. Duct shall be equal to Thermaflex M-KE.

2.8 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 access panels for inspection and servicing of duct mounted equipment; reheat coils, sound attenuators, and smoke and fire dampers.

D. Install flexible connections in ducts at connections to plenums, apparatus casings, fan housings, roof top units, air handling units, exhaust fans and other equipment which could transmit vibrations to the duct systems. Crimp 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 vibration of connected equipment.

E. Install turning vanes in all square or rectangular 90° elbows in supply, return, and exhaust air systems.

F. 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.

G. Installation of Fire Dampers:

1. Install fire dampers in all locations where ducts penetrate fire walls and floors, as indicated on the Drawings.

2. Install dampers in accordance with manufacturer's recommendations, utilizing steel sleeves, angles, and practices as required to provide an installation equivalent to that utilized by the manufacturer when the dampers are UL tested.
3. At each damper, install access panel arranged for servicing fusible link.
4. Contractor shall demonstrate, in presence of Owner's Representative, the operation of each fire damper. Fusible link shall be disconnected and damper shall be allowed to close. If no binding or sticking is evident, damper shall be set in the open position and fusible link reinstalled.

END OF SECTION

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SECTION 23 3600
AIR TERMINAL UNITS

PART 1 GENERAL

1.1 SUMMARY

A. Provide material, equipment, labor and supervision necessary to install variable air volume units as required by the Drawings and this Section.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer' s technical product data, including performance data for each size and type of terminal air box furnished; schedule showing drawing designation, dimensions, clearances, room location, number furnished, model number, size, and accessories furnished; and installation and start-up instructions.

1.3 QUALITY ASSURANCE

A. Standards

1. All unit lining materials shall meet the requirements of NFPA 90A and U.L. 181.
2. Compliance with performance specified on drawings, including sound power, shall be verified by certified data derived from tests conforming to ADC Test Code 1062 and ANSI-S-1.21-72, except for specific requirements herein.
3. ARI 880 - Air Conditioning and Refrigeration Institute Standard Rating Conditions for Air Terminals.

B. The unit manufacturer shall refer to the temperature control specifications for interface devices and information required to ensure equipment compatibility.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide variable air volume units by Titus, Carnes, Nailor, Price, Krueger, Tuttle and Bailey, Enviro-Tec (JCI), Anemostat, Phoenix, Critical Room Control, or Engineer approved equivalent. Arrangement, capacity, performance and type as scheduled and/or indicated on the Drawings.

2.2 GENERAL

A. Provide factory-fabricated and tested variable air volume units as indicated, selected with performance characteristics which match or exceed those indicated on schedule.

B. Units shall consist generally of variable volume damper, adjustable maximum air volume regulator and other items as required for proper operation.

C. Sound powers over the full throttling range of the unit shall not exceed the maximum sound power listed on the drawings even on a rise in inlet pressure (up to 1” at 50 percent of air flow) above the design.

2.3 CASINGS

A. Units shall be completely factory assembled, manufactured of corrosion protected welded steel, and fabricated with a minimum of 22-gauge metal.

B. Inside surfaces shall have lining material suitable to provide required acoustic performance, thermal insulation, and prevent sweating. Lining thickness shall be not less than 1/2 inch. Lining shall be secured to supporting surfaces in such a manner that it will not delaminate, sag or settle. Surfaces, including edges, shall be faced with solid metal or coated so that material is not detached by the air stream.

C. Casing shall have removable panels large enough to provide access to all moving parts for inspection, adjustment, and maintenance without disconnecting ducts. Panels shall be flush, gasketed airtight, and held in place by screwdriver operated quarter-turn latches.

D. Total leakage from casings shall not exceed 1% of the nominal capacity when subjected to a pressure of 1 inch W.G. in low pressure section with all outlets and inlets sealed off. Leakage rate of closed dampers shall not exceed 1% of specified capacity when close-off pressure differential is 4 inches W.G.

E. Units shall be rigidly supported so they remain stationary at all times. Cross-bracing or other means of stiffening shall be provided as necessary. Method of support shall be such that distortion and malfunction of units cannot occur.

2.4 AIR DAMPERS

A. Locate air volume damper and automatic flow control assembly inside unit casing. Construct from extruded aluminum or 20 gauge galvanized steel components. Key damper blades into shaft with nylon fitted pivot points. Flow sensor shall be provided regardless of control chosen. Flow sensor shall be a ring or cross. [Bar or single point sensing device is not acceptable.]

B. Mount manually operated damper quadrant or automatic damper operator and automatic flow control assembly.

C. Air volume control damper shall be factory calibrated assembly consisting of air modulation damper and extension for connection to control actuator. All actuator linkage shall be protected by a sheet metal enclosure.

2.5 CONTROLS

A. Refer to Temperature Control specification sections.

B. Controls for the unit are to be supplied, mounted, calibrated and tested in the field by the controls contractor. Thermostat, 24V power and all external control wiring by temperature control contractor.

C. Disconnect and internal wiring shall be by by unit manufacturer.

D. Variable air volume units shall control and measure air flow within a +5% at any duct pressure.

E. Variable air volume units shall be pressure independent and shall reset to any air flow between minimum and maximum scheduled cfm.

2.6 ELECTRIC HEATING COIL

A. The electric heating coil shall be ETL listed to UL 1995 and CSA 22.2, and provided by the terminal unit manufacturer.

B. The electric coil casing shall be constructed from a minimum 20 gauge, 0.038 inch galvanized steel.

C. The heating elements shall be open wire nickel chrome construction, supported by ceramic insulators.

D. The integral control panel shall be a NEMA 250, Type 1 enclosure with hinged access door for access to all controls and safety devices.

E. The electric coils shall be provided with a primary automatic reset thermal cutout, a manual reset thermal cutout, and a differential pressure airflow switch for proof of airflow.

F. The electric coils shall be able to be flipped 180 degrees if necessary

G. The electric coils shall be provided with a non-fused door interlocking disconnect switch.

H. The electric coils shall be provided with a silicon-controlled rectifier (SCR) controller.

2.7 IDENTIFICATION

A. Identify each unit with clearly marked identification label and airflow indicator. Label shall include unit nominal air flow, maximum factory set air flow, minimum factory set air flow and box number which corresponds to schedule on drawings.

2.8 PROVIDE THE FOLLOWING FEATURES AND ACCESSORIES:

A. Bottom Access Panels.

2.9 WIRING

A. Mount electrical components in control box with removable cover. Incorporate single point electrical connections to power source.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install units as indicated on plans, and in accordance with manufacturer’s installation instructions.

B. Location: Install each unit level and accurately in position indicated in relation to other work; and maintain sufficient clearance for normal service and maintenance, but in no case less than that recommended by manufacturer. Support units independently of adjacent ductwork.

C. Duct Connections: Connect ductwork to units in accordance with Division 23 ductwork sections.

3.2 FIELD QUALITY CONTROL

A. Upon completion of installation and prior to initial operation, test and demonstrate that units and duct connections to units are leak-tight.

3.3 STARTUP SERVICE

A. Perform startup service:

1. Complete installation and startup checks according to manufacturer's written instructions.

2. Verify that inlet duct connections are as recommended by air terminal unit manufacturer to achieve proper performance.
3. Verify that controls and control enclosure are accessible.
4. Verify that control connections are complete.
5. Verify that nameplate and identification tag are visible.
6. Verify that controls respond to inputs as specified.

3.4 ADJUSTING

A. Reset volume with damper operator attached to assembly allowing flow range modulation from 100 percent of design air flow to minimums and heating CFMs as scheduled on Drawings.

END OF SECTION

SECTION 23 3713
DIFFUSERS, REGISTERS, AND GRILLES

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes ceiling- and wall-mounted diffusers, registers, and grilles.

1. Provide materials, devices, labor and supervision necessary for the installation of diffusers, registers and grilles
2. Provide diffusers, registers and grilles as per schedule on Drawings.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data for diffusers, registers and grilles including the following:

1. Schedule of diffusers, registers and grilles indicating drawing designation, room location, number furnished, model number, size and accessories furnished.
2. Data sheet for each type of grille, register and diffuser and accessory furnished; indicating construction, finish and mounting details.
3. Performance data for each type of grille, register and diffuser furnished, including aspiration ability, temperature and velocity traverses, throw and drop, and noise criteria ratings. Indicate selections on data.

B. Shop Drawings: Submit manufacturer’s assembly-type shop drawing for each type of grille, register and diffuser, indicating materials and methods of assembly of components.

1.3 QUALITY ASSURANCE

A. Codes and Standards:

1. AHRI Compliance: Test and rate diffusers, registers and grilles in accordance with ARI 650 “Standard for Air Outlets and Inlets.”
2. ASHRAE Compliance: Test and rate diffusers, registers and grilles in accordance with ASHRAE 70 “Method of Testing for Rating the Air Flow Performance of Outlets and Inlets.”
3. NFPA Compliance: Install diffusers, registers and grilles in accordance with NFPA 90A “Standard for the Installation of Air Conditioning and Ventilating Systems.”

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Products by Titus, Krueger, Carnes, Metal-aire, Nailor, Price, or Engineer Pre-Approved Equivalent.

2.2 CEILING DIFFUSERS – SQUARE PANEL

A. Architectural square panel ceiling diffusers shall be of the sizes and mounting types shown on the plans and outlet schedule. The diffuser shall have a heavy gauge aluminum face panel that captures a secondary heavy gauge aluminum panel. The face panel is removable by means of four hanger brackets. The exposed surface of the face panel shall be smooth, flat, and free of visible fasteners.

B. The face panel shall project ¼ inch below the outside border of the diffuser backpan. The back of the face panel shall have an aerodynamically shaped, rolled edge to ensure a tight horizontal discharge pattern. Ceiling diffusers with a 24 x 24-inch full face shall have no less than an 18 x 18-inch face panel size. Ceiling diffusers with a 12 x 12-inch full face shall have no less than a 9 x 9-inch face panel size.

C. The backpan shall be one piece precision die-stamped and shall include an integrally drawn inlet. The diffuser backpan shall be constructed of 22-gauge aluminum. The diffuser neck shall have a minimum of 1 1/4 –inch depth available for duct connection.

D. The finish shall be #26 white. The finish shall be an anodic acrylic paint, baked at 315 degrees F for 30 minutes. The pencil hardness must be HB to H.

E. The paint must pass a 100-hour ASTM B117 Corrosive Environments Salt Spray Test without creepage, blistering or deterioration of film. The paint shall pass a 250-hour ASTM D870 Water Immersion Test and pass the ASTM D2794 Reverse Impact Cracking Test with a 50-inch pound force applied.

F. The manufacturer shall provide published performance data for the square panel diffuser. The diffuser shall be tested in accordance with ANSI/ASHRAE Standard 70-1991.

PART 3 EXECUTION

3.1 INSTALLATION

A. General: Install diffusers, registers and grilles in accordance with manufacturer's written instructions and in accordance with recognized industry practices to insure that products serve intended functions.

B. Coordinate with other work, including ductwork and duct accessories, as necessary to interface installation of air outlets and inlets with other work.

C. Install wall mounted grilles and registers plumb and level and flush to surface. Locations may be altered slightly, as acceptable to the Architect/Engineer so as to fit portions of the structure.

D. In grid panel type ceilings, lay-in metal pan, acoustical, etc., diffusers, registers and grilles shall be located as shown on the reflected ceiling plan or as directed by the Architect/Engineer typically to minimize cutting of ceiling panels.

E. Coordinate location of ceiling diffusers and registers with Architect's reflected ceiling plan.

F. Provide transitions as required for connections to ductwork, including square to round.

G. Coordinate wall grilles and registers with thin-line type fire dampers in fire rated walls.

H. Install diffusers, registers, and grilles level and plumb.

I. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.2 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION

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SECTION 23 5400
FURNACES AND CONDENSING UNITS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Forced air furnaces.

B. Thermostats.

C. Condensing units.

D. Evaporator coils.

E. Flues.

1.2 RELATED REQUIREMENTS

A. Section 23 1123 - Facility Natural-Gas Piping.

B. Section 23 0513 - Common Motor Requirements for HVAC Equipment: Additional requirements for fan motors.

C. Section 23 3113 - Metal Ducts

1.3 REFERENCE STANDARDS

A. AHRI 610 (I-P) - Performance Rating Of Central System Humidifiers for Residential Applications; 2014.

B. ANSI Z21.47 - American National Standard for Gas-Fired Central Furnaces; 2016.

C. ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. ASHRAE Std 103 - Methods of Testing for Annual Fuel Utilization Efficiency of Residential Central Furnaces and Boilers; 2017, with Errata (2019).

E. NEMA MG 00001 - Motors and Generators; 2024.

F. NFPA 54 - National Fuel Gas Code; 2018.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2021.

I. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2018.

J. NFPA 211 - Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances; 2019.

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

1.4 SUBMITTALS

A. See Division 01 for submittal procedures.

B. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.

C. Shop Drawings: Indicate assembly, required clearances, and location and size of field connections.

D. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.

E. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

F. Project Record Documents: Record actual locations of components and connections.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

1. See Division 01 for additional product requirements.
2. Extra Filters: One for each furnace.
3. Extra Pilot Thermocouples: One for each furnace.

1.5 QUALITY ASSURANCE

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

B. All units shall be furnished by the same manufacturer.

1.6 WARRANTY

A. See Division 01 for additional warranty requirements.

B. Provide three year manufacturers warranty for solid state ignition modules.

C. Provide five year manufacturers warranty for heat exchangers and compressors.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Carrier Corporation.

B. Trane Inc.

C. York International Corporation / Johnson Controls.

D. Amana.

E. Daikin

F. Engineer Pre-Approved Equivalent

2.2 REGULATORY REQUIREMENTS

A. Comply with NFPA 70.

B. Products Requiring Electrical Connection: Listed and classified by UL (DIR) as suitable for the purpose specified and indicated.

2.3 GAS FIRED FURNACES

A. Annual Fuel Utilization Efficiency (AFUE): 0.95 ("condensing") in accordance with ASHRAE Std 103.

B. Units: Self-contained, high efficiency, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heating element, controls, air filter, humidifier, and accessories; wired for single power connection with control transformer.

1. Safety certified by CSA in accordance with ANSI Z21.47.
2. Venting System: Direct.
3. Combustion: Sealed.
4. Air Flow Configuration: Upflow.
5. Heating: Natural gas fired.
6. Accessories:
    a. Condensate drain.
    b. Concentric wall termination kit.
    c. Acid neutralization kit.

C. Performance:

1. As scheduled on Drawings.

D. Cabinet: Steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.

E. Primary Heat Exchanger:

1. Material: Stainless steel.
2. Shape: Tubular type.

F. Secondary Heat Exchanger:

1. Material: Stainless steel.

G. Gas Burner:

1. Atmospheric type with adjustable combustion air supply.
2. Gas valve, two stage provides 100 percent safety gas shut-off; 24 volt combining pressure regulation, safety pilot, manual set (On-Off), pilot filtration, automatic electric valve.
3. Electronic pilot ignition, with electric spark igniter.
4. Combustion air damper with synchronous spring return damper motor.
5. Non-corrosive combustion air blower with permanently lubricated motor.

H. Gas Burner Safety Controls:

1. Thermocouple sensor: Prevents opening of gas valve until pilot flame is proven and stops gas flow on ignition failure.
2. Flame rollout switch: Installed on burner box and prevents operation.
3. Vent safety shutoff sensor: Temperature sensor prevents operation, manual reset.

4. Limit Control: Fixed stop at maximum permissible setting, de-energizes burner on excessive bonnet temperature, automatic resets.

I. Supply Fan: Centrifugal type rubber mounted with direct drive with adjustable variable pitch motor pulley.

J. Motor:

1. 1750 rpm multiple speed, permanently lubricated, hinge mounted.
2. Refer to Section 23 0513.

K. Air Filters: 2 inch thick glass fiber, disposable type arranged for easy replacement.

L. Operating Controls:

1. Controlled by DDC System. See section 23 0923 and control drawings and sequences.

2.4 CONTROLS

A. Furnish, install, and wire combination heating and cooling thermostats.

B. Combination heating and cooling thermostats shall have locking, vandal-proof cover.

C. Furnish, install, and wire optional remote discharge air (duct mount) temperature sensor for each furnace and at least one outdoor temperature sensor.

D. Room Thermostat: Low voltage, electric solid state microcomputer based room thermostat with remote sensor:

1. System selector switch (heat-off) and fan control switch (auto-on).
2. Preferential rate control to minimize overshoot and deviation from setpoint.
3. Set-up for four separate temperatures per day.
4. Instant override of setpoint for continuous or timed period from one hour to 31 days.
5. Short cycle protection.
6. "Dry Mode" or "dehumidification mode" capability.
7. Programming based on every day of the week.
8. Selection features including degree F or degree C display, 12 or 24 hour clock, keyboard disable, remote sensor, fan on-auto.
9. Battery replacement without program loss.
10. Thermostat Display:
    a. Time of day.
    b. Actual room temperature.
    c. Programmed temperature.
    d. Programmed time.
    e. Duration of timed override.
    f. Day of week.
    g. System Mode Indication: Heating, cooling, fan auto, off, and on, auto or on, off.

2.5 CONDENSING UNIT AND EVAPORATOR COIL

A. Condensing units shall have capacity as scheduled on Drawings. Unit shall have rigid welded weatherproof casing construction with removable panels for complete access. Minimum 20 gauge cabinet with attractive finish coat of paint. Provide coil hail and snow protection guards.

B. Condensing units shall be quiet operating with slow speed condenser fan. Shall be suitable for operation down to 30 °F with automatic thermal cutout, automatic reset high and low refrigerant pressure switches. Provide unit with timer off control, low ambient controls, and hard start kit.

C. Compressers shall be hermetic with suction and liquid line service valves, full refrigerant charge, internal overload protection, copper tube aluminum fin condenser coil. Provide crankcase heater. Compresser shall be served by a five year replacement warranty.

D. Cooling coils shall be cased A type configuration copper tube aluminum fin or aluminum tube and fin, leak tested at factory. Drip pans shall be galvanized steel coated with waterproof enamel paint or mastic.

E. Refrigerant lines shall be sized and installed per manufacturer's recommendations. Suction line to be insulated. Insulate fittings as required to prevent sweating.

F. Condensing unit shall meet or exceed efficiency values as scheduled on Drawings.

2.6 FLUES

A. Vent materaial shall be UL Listed and meet equipment manufacturer's requirements.

B. Provide side-wall support assembly.

C. Accessories:

1. Base section with bottom drain.
2. Sidewall concentric or low-profile fitting.

D. Joints shall be sealed per manufacturer's recommendations.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrates are ready for installation of units and openings are as indicated on shop drawings.

B. Verify that proper power supply is available and located correctly.

C. Verify that proper fuel supply is available for connection.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions and requirements of authorities having jurisdiction.

B. Install in accordance with NFPA 90A.

C. Install gas fired furnaces in accordance with NFPA 54.

D. Provide vent connections in accordance with NFPA 211.

E. Install flue and combustion air per manufacturer's instructions.

F. Install clean filters at end of construction.

G. Install furnaces and condensing units on mounting blocks or furnace stands.

END OF SECTION

SECTION 23 7413
PACKAGED OUTDOOR AIR-HANDLING UNITS

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes semi-custom packaged air handling units.

B. Provide material, equipment, labor and supervision necessary to install air handling units as required by the Drawings and this Section. Verify dimensions and coordinate shipping requirements.

1.2 SUBMITTALS

A. Shop drawings shall indicate assembly, unit dimensions, weight loading, required clearances, construction details, and field connection details.

B. Product data shall indicate dimensions, weights, capacities, ratings, fan performance, motor electrical characteristics, and gauges and finishes of materials.

C. Provide fan curves with specified operating point clearly indicated.

D. Submit sound power levels for both fan outlet and casing radiation at rated capacity.

E. Submit product data of filter media, filter performance data, filter assembly, and filter frames.

F. Submit electrical requirements for power supply wiring including wiring diagrams for interlock and control wiring clearly indicating factory installed and field installed wiring.

1.3 QUALITY ASSURANCE AND STANDARDS

A. Fan Performance Ratings: Conform to AMCA 210 and bear the AMCA Certified Rating Seal.

B. Sound Ratings: Tested to AMCA 300.

C. AMCA 500 - Test Methods for Louver, Dampers, and Shutters.

D. AHRI Standard 340/360- Unitary Large Equipment

E. Filter Media: UL 900 listed.

F. Air coils: Certify capacities, pressure drops, and selection procedures in accordance with AHRI 410.

G. Source Limitations: Obtain modular indoor air-handling units through one source from a single manufacturer.

1.4 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data with closeout submittals

B. Include instructions for lubrication, filter replacement, motor and drive replacement, spare parts lists, and wiring diagrams.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site.

B. Handle carefully to avoid damage to components, enclosures, and finish.

C. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

1.6 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.

1.7 EXTRA STOCK

A. Provide one extra set of 2” MERV 8 filters and 4" MERV 13 filters for each unit.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Daikin
2. Johnson Controls/York
3. Aaon
4. Carrier
5. Engineer Pre-Approved Equivalent

B. Contractor, supplier or manufacturer providing products other than the bases of design shall bear cost of required modifications to spaces, services, utilities and other features as result of accepting substitute products, including but not limited to:

1. Larger capacity mechanical or electrical service, devices or utilities resulting from acceptance of product for bidding purposes.
2. Modification to pipes, conduits, ducts, and controls for conveying, distributing, and controlling those services or utilities.
3. Modification to insulation, wrappings, coatings, or other integral features of lines or items conveying those lines.
4. Design fees associated with changes.

2.2 MANUFACTURED UNITS

A. Each unit shall be specifically designed for outdoor rooftop application and include a weatherproof cabinet. Units shall be of a modular design with factory installed access sections available to provide maximum design flexibility.

B. Furnish unit configuration, layout, performance and electrical characteristics as shown on project plans and schedule.

C. The unit shall undergo a complete factory run test prior to shipment. The factory test shall include final test of all fan assemblies, a refrigeration circuit run test, a unit control system operations checkout, a unit refrigerant leak test, and a final unit inspection.

D. The complete unit shall be ETL listed.

E. Unit shall be completely factory assembled and shipped in one piece.

F. Unit to be shipped fully charged with R32.

G. All units shall have decals and tags to indicate caution areas and aid unit service. Unit nameplates shall be fixed to the main control panel door. Electrical wiring diagrams shall be attached to the control panels. Installation, operating and maintenance bulletins and start-up forms shall be supplied with each unit.

2.3 CASINGS

A. Unit construction for all walls, doors, ceiling and floor shall be double wall with a solid galvanized steel liner with a thermal break integral to the panel construction that provides a cleanable interior, prevents conductive heat transfer through the panel, and prevents exterior condensation on the panel.

B. Unit construction for all walls, doors, ceiling and floor shall be double wall with a solid stainless steel liner with a thermal break integral to the panel construction that provides a cleanable interior, prevents conductive heat transfer through the panel and prevents exterior condensation on the panel.

C. Foam Insulation shall provide a minimum thermal resistance R-value of 13.0.

D. Unit construction shall be designed to operate at total static pressures up to 8.0 inches w.g.

E. Provide quality unit construction with performance tested in accordance with ASHRAE Std 111 – cabinet air leakage shall not exceed leak class 6 (CL = 6), at +/- 6 in. w.c. casing pressure, where maximum cabinet leakage (cfm/100 ft^2 of casing surface area) = CL x P^0.65.

F. Provide quality unit construction with air leakage less than 0.5% of design airflow up to 5 in. w.c..

G. Provide quality unit construction with air leakage less than 1.0% of design airflow up to 8 in. w.c..

H. Exterior surfaces shall be constructed of pre-painted galvanized steel for aesthetics and long term durability. Paint finish to include a base primer with a high quality, polyester resin topcoat in manufacture's standard color. Finished surface to withstand a minimum 1000-hour salt spray test in accordance with ASTM B117 standard for salt spray resistance.

I. Access shall be provided to filters, dampers, cooling coils, fan sections, compressors and electrical and controls components.

J. Access doors shall be provided for each critical maintenance section in order to provide user easy access to components. All access doors shall be mounted on full length stainless steel piano hinges and shall be secured by linkage and latch system that is operated by a single handle. The latch system shall feature a staggered engagement for ease of operation and a safety catch shall protect the user from injury in case a positive pressure door is opened while the fan is operating. Doors secured by multiple, mechanical fasteners are not acceptable.

K. The unit base frame shall be constructed of 13 gauge pre-painted steel to prevent base rail corrosion.

L. Safety Grates

1. Walk on safety grates shall be provided in the bottom supply and return air openings and be able to support a concentrated load of 1000lbs at mid-span.

M. The unit base shall overhang the roof curb for positive water runoff and shall have a formed recess that seats on the roof curb gasket to provide a positive, weathertight seal. Lifting brackets shall be provided on the unit base with lifting holes to accept cable or chain hooks.

2.4 ACOUSTICS

A. Equipment sound performance shall meet the following scheduled discharge and return sound power levels. Provide compressor sound blankets, low sound condenser fans, and other low sound options to achieve these levels.

Sound Power (db)								
Frequency	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Inlet	72	69	69	63	644	63	60	70
Discharge	81	85	80	82	81	78	76	69
Radiated	48	79	85	89	90	89	88	84

2.5 FANS

A. All Supply and Exhaust Fans shall be configured in an array with a minimum number fans as specified on the drawings.

B. Each supply and exhaust fan motor shall have an independent integral inverter per motor for redundancy.

C. All Fans shall be dynamically balanced as an assembly in planes as per DIN / ISO 21940 to balancing grade G 6.3 or better.

D. All fans shall be provided with totally enclosed maintenance-free ball bearings and permanent lubrication. Bearings shall be selected for a minimum life in excess of 350,000 hrs (L50) at selected operating point.

E. ECM Supply and Exhaut Fans

1. All fans shall be a single width, single inlet (SWSI) airfoil centrifugal fan. The fan wheel shall be Class II construction with aluminum fan blades that are continuously welded to the hub plate and end rim. The fan shall be a direct drive fan mounted to the motor shaft. Belts and sheaves are not acceptable due to the additional maintenance.

2. The fan motor shall be a totally enclosed electrically commutated motor that is speed controlled by the rooftop unit controller. The motor shall include thermal overload protection and protect the motor in the case of excessive motor temperatures. The motor shall have phase failure protection and prevent the motor from operation in the event of a loss of phase. Motors shall be premium efficiency.

2.6 COOLING COIL

A. The cooling coil section shall be installed in a a draw through configuration, upstream of the supply air fan. The coil section shall be complete with factory piped cooling coil and sloped drain pan.

B. Direct expansion (DX) cooling coils shall be fabricated of seamless 1/2" diameter high efficiency copper tubing that is mechanically expanded into high efficiency aluminum plate fins. Coils shall be a multi-row, staggered tube design with a minimum of 4 rows. All units shall have two independent refrigerant circuits and shall use an interlaced coil circuiting that keeps the full coil face active at all load conditions.

C. Each refrigeration circuit shall be equipped with a thermostatic expansion valve for control refrigerant flow control.

D. The refrigerant suction lines shall be fully insulated from the expansion valves to the compressors.

E. The distributor tubes shall be sleeved or coated to provide longevity and protection from leaks.

F. All coils shall be factory leak tested with high pressure air under water.

G. The drain pan shall be stainless steel and designed to comply with ASHRAE- 62.1 double sloped requirements drain pan shall be provided with the cooling coil. The drain pan shall extend beyond the leaving side of the coil and underneath the cooling coil connections. The drain pan shall have a minimum slope of 1/8" per foot to provide positive draining. The drain pan shall be connected to a threaded drain connection extending through the unit base. Units with stacked cooling coils shall be provided with a secondary drain pan piped to the primary drain pan.

H. Insulation under the drain pan should be a closed cell structure to prevent moisture from wicking under the drain pan. Fiberglass is not allowed.

2.7 GAS FIRED HEATING SECTION

A. Heat Exchanger: Stainless Steel

B. Gas Burner: Atmospheric type burner with adjustable combustion air supply, pressure regulator, gas valve, manual shut-off, intermittent spark or glow coil ignition, flame sensing device, and automatic 100% shut-off pilot, modulating heating capacity.

C. Gas Burner Safety Controls: Energize ignition, limit time for establishment of flame, prevent opening gas valve until pilot flame is proven, stop gas flow in ignition failure, energize blower motor, and after air flow proven and slight delay, allow gas valve to open.

D. High Limit Control: Temperature sensor with fixed stop at maximum permissible setting, de-energize burner on excessive bonnet temperature and energize burner when temperature drops to a lower safe value.

E. Supply Fan Control: Temperature sensor sensing bonnet temperatures and indepentendent of burner control, with provisions for continuous fan operation.

2.8 FILTER SECTION

A. All units shall be provided with clogged filter switches and alarm enunciation.

B. All units shall be provided with a through the wall magnehelic filter gauge that displays filter loading.

C. Unit shall be provided with a draw-through filter section.

D. The filter rack shall be designed to accept a 2" MERV 8 pleated pre-filter and a 4" MERV 13 post filter. Manufacturer shall provide all filters.

2.9 OUTDOOR/RETURN AIR SECTION

A. Unit shall be provided with a Metal Mesh pre-filter in the outdoor air hood/section to prefilter large particulate to prevent early filter clogging.

B. Unit shall be provided with an outdoor air economizer section. The economizer section shall include outdoor, return, and exhaust air dampers. The economizer operation shall be fully integral to the mechanical cooling and allow up to 100% of mechanical cooling if needed to maintain the cooling discharge air temperature. The outdoor air hood shall be factory installed and constructed from galvanized steel finished with the same durable paint finish as the main unit. The outside and return air dampers shall be sized to handle 100% of the supply air volume. The dampers shall be parallel blade design. Damper blades shall be gasketed with side seals to provide an air leakage rate of 1.5 cfm / square foot of damper area at 1" differential pressure in according with testing defined in AMCA 500. Control of the dampers shall be by a factory installed direct coupled actuator.

C. Damper actuator shall be fully modulating and spring return type. A comparative enthalpy control shall be provided to sense and compare enthalpy in both the outdoor and return air streams to determine if outdoor air is suitable for "free" cooling. If outdoor air is suitable for "free" cooling, the outdoor air dampers shall modulate in response to the unit's temperature control system.

D. A barometric exhaust damper shall be provided to exhaust air out of the unit. A bird screen shall be provided to prevent infiltration of rain and foreign materials.

E. Provide factory installed and tested, outdoor air monitor that controls outdoor air +/- 15% accuracy down to 40 cfm per ton.

2.10 CONDENSING SECTION

A. All Units shall provide the Energy Efficiency specified EER and IEER per the schedule equipment or higher.

B. Condenser fans shall have manufacturer's quiet fan blade option.

C. Condenser fans shall be direct drive, axial type designed for low tip speed and vertical air discharge. Fan blades shall be constructed of steel and riveted to a steel center hub. Condenser fan motors shall be heavy-duty, inherently protected, three-phase, non-reversing type with permanently lubricated ball bearing and integral rain shield.

D. Condenser coils shall be an all aluminum design, and mounted on polymer brackets, to minimize di-electric corrosion. The aluminum tube shall be a micro channel design with high efficiency aluminum fins. Fins shall be brazed to the tubing for a direct bond. Each condenser coil shall be factory leak tested with high-pressure air under water.

E. Condenser coils shall be protected from incidental contact to coil fins by a coil guard. Coil guard shall be constructed of cross wire welded steel with PVC coating.

F. Head Pressure Control:

1. Units shall have at least one condenser fan per circuit to maintain positive heat pressure and a VFD on each circuit to modulate condenser fans to provide a mechanical cooling down to 30ºF.

G. Each unit shall have multiple, heavy-duty scroll compressors. Each compressor shall be complete with gauge ports, crankcase heater, sight-glass, anti-slug protection, motor overload protection and a time delay to prevent short cycling and simultaneous starting of compressors following a power failure. Compressors shall be isolated with resilient rubber isolators to decrease noise transmission.

H. Each unit shall have two independent refrigeration circuits for redundancy. Each circuit shall be complete with a low pressure control, filter-drier, liquid moisture indicator/sight-glass, thermal expansion valve, and a manual reset high pressure safety switch. The thermal expansion valve shall be capable of modulation from 100% to 25% of its rated capacity. Sight-glasses shall be accessible for viewing without disrupting unit operation. Each circuit shall be dehydrated and factory charged with Refrigerant R32 and oil.

I. Each unit shall have at least 4 compressor stages of cooling capacity control for better part load control as required by energy code.

2.11 ELECTRICAL

A. Unit wiring shall comply with NEC requirements and with all applicable UL standards. All electrical components shall be UL recognized where applicable. All wiring and electrical components provided with unit shall be number and color coded and labeled according to the electrical diagram provided for easy identification.

B. [if !supportLists]The unit shall be provided with a factory wired weatherproof control panel. Unit shall have a power terminal block for main power connection. A terminal board shall be provided for low voltage control wiring. Branch circuit short circuit protection, 115 volt control circuit transformer and fuse, system switches, and a high temperature sensor. Each compressor and condenser fan motor shall be furnished with contactors and inherent thermal overload protection. Supply and return fan motors shall have contactors and external overload protection. Knockouts shall be provided in the of the main control panels for field wiring entrance.

C. All 115-600 volt internal and external wiring between control boxes and components shall be protected from damage by dedicated electrical raceways.

D. [if !supportLists]The receptacle shall be powered by a factory supplied 115V transformer and will be available when the disconnect is in the off position.

E. Single disconnect switch shall be provided for connecting electrical power at the unit. Disconnect switches shall be mounted internal to the control panel and operated by an externally mounted handle.

F. [if !supportLists]Unit SCCR Rating to be 65 kAIC. minimum.

G. Unit shall be provided with phase, voltage and brown out protection which shuts down all motors in the unit if the electrical phases are more than 10% out of balance on voltage or on phase reversal.

H. Unit shall be provided with a safety shutdown terminal for installation of field emergency input

I. All electrical options shall have a +/- 10 percent voltage utilization range to protect against voltage variation.

J. Unit shall be provided with a safety shutdown terminal for installation of field emergency input.

2.12 CONTROLS

A. Manufacture controls shall be for refrigeration controls only. All other controls shall be by controls contractor. Refer to Section 23 0923, Direct-Digital Controls for HVAC, and sequences of controls on the drawings for additional information. The controls contractor and RTU manufacturer shall coordinate all controls requirements prior to bidding.

2.13 WARRANTY

A. Provide 12 month warranty. Defective parts will be repaired or replaced during the warranty period at no charge. The warranty period shall commence at substantial completion. Material warranty shall be provided by equipment manufacturer. Labor warranty shall be provided by installing contractor.

PART 3 EXECUTION

3.1 EXAMINATION

A. Installer shall examine areas and conditions under which packaged rooftop air-conditioning units are to be installed, and notify Engineer 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 PACKAGED AIR-CONDITIONING UNITS

A. Install packaged air-conditioning units where shown in accordance with equipment manufacturer's written instructions, and recognized industry practices, to ensure that units comply with requirements and serve intended purposes.

B. Coordinate with other work, including ductwork, vibration isolation, piping and electrical work, as necessary to interface installation of packaged air-conditioning units with other work.

C. Temporary Closure: Upon completion of installation, provide protective covering on packaged air-conditioning unit ductwork connection openings to prevent entrance of dust and debris into equipment.

D. Extend main cooling coil condensate drains through traps and down to grade.

E. Install new filters at completion of rooftop system work, prior to testing, adjusting, and balancing work.

F. Duct Connections: Provide ductwork, accessories, and flexible connections as indicated.

3.3 TESTING

A. Upon completion of packaged air-conditioning units and connection to completed air distribution system, start-up and test equipment in accordance with AHRI Standards; operate unit to demonstrate capability and compliance with requirements. Where possible, field-correct malfunctioning units, then retest to demonstrate compliance.

3.4 MANUFACTURER'S START-UP

A. Manufacturer shall furnish a factory trained service engineer without additional charge to start the unit(s).

END OF SECTION

SECTION 23 8126.13
SMALL-CAPACITY SPLIT-SYSTEM AIR CONDITIONERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Air-source heat pumps.

B. Air cooled condensing units.

C. Indoor air handler (fan & coil) units for duct connection.

D. Controls.

1.2 REFERENCE STANDARDS

A. AHRI 210/240 - Standard for Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2008, Including All Addenda.

B. AHRI 520 - Performance Rating of Positive Displacement Condensing Units; 2004.

C. ASHRAE Std 15 - Safety Standard for Refrigeration Systems and Designation and Classification of Refrigerants; 2019.

D. ASHRAE Std 23.1 - Methods for Performance Testing Positive Displacement Refrigerant Compressors and Condensing Units that Operate at Subcritical Pressures of the Refrigerant; 2019.

E. NEMA MG 00001 - Motors and Generators; 2024.

F. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2021.

G. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2018.

H. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

1.3 SUBMITTALS

A. See Section 01 3300 - Submittal Procedures, for submittal procedures.

B. Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.

C. Shop Drawings: Indicate assembly, required clearances, and location and size of field connections.

D. Design Data: Indicate refrigerant pipe sizing.

E. Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.

F. Warranty: Submit manufacturers warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.4 WARRANTY

A. Provide five year manufacturers warranty for condensing units and compressors. Include parts and labor.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Daikin

B. Samsung

C. LG

D. Mitsubishi.

E. Engineer pre-approved equivalent.

F. Substitutions: See Division 01 for product requirements.

2.2 SYSTEM DESIGN

A. Split-System Heating and Cooling Units: Self-contained, packaged, matched factory-engineered and assembled, pre-wired indoor and outdoor units; UL listed.

1. Heating and Cooling: Air-source electric heat pump located in outdoor unit with evaporator; auxiliary electric heat.

2. Provide refrigerant lines internal to units and between indoor and outdoor units, factory cleaned, dried, pressurized and sealed, with insulated suction line.

B. Performance Requirements: See Drawings for additional requirements.

C. Electrical Characteristics: As Scheduled

2.3 INDOOR UNITS FOR DUCTED SYSTEMS

A. Indoor Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heating and cooling element(s), controls, and accessories; wired for single power connection with control transformer.

1. Air Flow Configuration: Horizontal.

2. Cabinet: Steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.

B. Supply Fan: Centrifugal type rubber mounted with direct or belt drive with adjustable variable pitch motor pulley.

1. Motor: NEMA MG 1; 1750 rpm single speed, permanently lubricated, hinge mounted.

C. Evaporator Coils: Copper tube aluminum fin assembly, galvanized or polymer drain pan sloped in all directions to drain, drain connection, refrigerant piping connections, restricted distributor or thermostatic expansion valve.

1. Construction and Ratings: In accordance with AHRI 210/240 and UL 207.

2. Manufacturers: System manufacturer.

2.4 OUTDOOR UNITS

A. Outdoor Units: Self-contained, packaged, pre-wired unit consisting of cabinet, with compressor and condenser.

1. Refrigerant: R32 or R454B.
2. Cabinet: Galvanized steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fiber insulation with reflective liner.
3. Construction and Ratings: In accordance with AHRI 210/240 with testing in accordance with ASHRAE Std 23.1 and UL 207.

B. Compressor: Hermetic, 3600 rpm, AHRI 520 resiliently mounted integral with condenser, with positive lubrication, crankcase heater, high pressure control, motor overload protection, service valves and drier. Provide time delay control to prevent short cycling and rapid speed changes.

C. Air Cooled Condenser: Aluminum fin and copper tube coil, AHRI 520 with direct drive axial propeller fan resiliently mounted, galvanized fan guard.

1. Condenser Fans: Direct-drive propeller type.
2. Condenser Fan Motor: Enclosed, 1-phase type, permanently lubricated.

D. Coil: Air-cooled, aluminum fins bonded to copper tubes.

E. Accessories: Filter drier, high pressure switch (manual reset), low pressure switch (automatic reset), service valves and gauge ports, thermometer well (in liquid line).

1. Provide thermostatic expansion valves.
2. Provide heat pump reversing valves.

F. Operating Controls:

1. Control by room thermostat to maintain room temperature setting.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that proper power supply is available and in correct location.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions and requirements of local authorities having jurisdiction.

B. Install in accordance with NFPA 90A and NFPA 90B.

C. Install refrigeration systems in accordance with ASHRAE Std 15.

END OF SECTION

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SECTION 23 8240
ELECTRIC UNIT HEATERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Provide materials, equipment, labor, and supervision necessary to install and test complete system of hot water unit heaters as required by the Drawings and this Section.

1.2 QUALIFICATIONS

A. Acceptable manufacturers are Markel, Trane, Berko, Indeeco, TPI Corporation - Raywall, or Engineer Pre-Approved Equivalent.

1.3 SUBMITTALS

A. Submit performance and product data.

PART 2 PRODUCTS

2.1 ELECTRIC CABINET UNIT HEATERS

A. Contractor shall supply and install heavy duty wall-mounted forced-air electric heater of the wattage, voltage and phase as indicated on the plans. The heater shall provide an even distribution of heated air to the space to be heated by drawing return air in the periphery of the heater, across and through the element and be discharged from the center section of the heater by means of an electric motor and axial flow fan blade.

B. Heater shall be vertical wall mount type.

C. Unit shall be two-stage.

D. Enclosure:

1. The assembly shall be constructed of heavy gauge steel with open toe space for return air and horizontal discharge grille. Grille assembly shall be attached to chassis by tamper-resistant (Allen head) machine screws. All parts of enclosure shall be heavy gauge steel, zinc coated both sides and finished in baked enamel. Color to be chosen by architect.

E. Motor shall be permanently lubricated, unit bearing, totally enclosed shaded pole type with impedance protection. Motors shall operate at no more than 1,300 rpm and shall be same voltage as the heater.

F. Provide perminant washable filters.

G. Element assemblies shall consist of two or three corrosion-resistant, steel-sheathed type elements mechanically bonded to common corrosion-resistant steel fins. Each sheathed element shall consist of helically coiled nickel chromium alloy resistant wire completely embedded in the surrounded by magnesium oxide, enclosed and wedged into corrosion resistant steel sheaths. Elements shall have a 2" cold conductor pin extending into sheath and shall have a density of no more than 60 watts per inch.

H. Heaters shall be equipped with a "zero voltage reset" thermal overload which disconnects elements and motor in the event normal operating temperatures are exceeded. For safety, if opened due to abnormal temperatures, thermal overload shall remain open until manually reset by turning heater off for five minutes. Automatic reset thermal overloads which allow the element to continue to cycle under abnormal conditions will not be accepted.

I. Heaters shall be Underwriters' Laboratories listed. Heaters shall conform to Underwriters' Standard 1025.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install systems as indicated on Plans and in the Specifications and as recommended by the manufacturer.

B. Install unit heaters as indicated, level. Anchor cabinet unit heaters to substrate. Use metallic concrete anchors. Mount unit heaters from structure per manufacturer's recommendations.

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. See Divsion 01 for submittal procedures, quality requirments, alterations of work, and closeout requirements.

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 COORDINATION

A. Coordinate arrangement, mounting, and support of electrical equipment:

1. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
2. So connecting raceways, cables, wireways, cable trays, and busways will be clear of obstructions and of the working and access space of other equipment.

B. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

PART 2 PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel.

1. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches (1270 mm) and no side more than 16 inches (400 mm), thickness shall be 0.052 inch (1.3 mm).

b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches (1270 mm) and 1 or more sides equal to, or more than, 16 inches (400 mm), thickness shall be 0.138 inch (3.5 mm).

2.2 SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Sealing Elements: EPDM or NBR interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
2. Pressure Plates: Carbon steel. Include two for each sealing element.
3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 GROUT

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

PART 3 EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

A. Comply with NECA 1.

B. Comply with applicable provisions of Occupational Safety and Health Act (OSHA), NFPA Standards and Pamphlets, NEIS Standards, and common work place practice.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

3.2 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Electrical penetrations occur when raceways, cables, wireways, cable trays, or busways penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

E. Cut sleeves to length for mounting flush with both surfaces of walls.

F. Extend sleeves installed in floors 2 inches (50 mm)above finished floor level.

G. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and raceway or cable, unless indicated otherwise.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry

1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants.".

J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."

K. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using cast-iron pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

3.3 SLEEVE-SEAL INSTALLATION

A. Install to seal exterior wall penetrations.

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

3.4 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electrical installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Firestopping."

END OF SECTION

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SECTION 26 0505
SELECTIVE DEMOLITION FOR ELECTRICAL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrical demolition.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that abandoned wiring and equipment serve only abandoned facilities.

B. Demolition drawings are based on casual field observation and existing record documents.

C. Report discrepancies to Architect/Engineer before disturbing existing installation.

D. Beginning of demolition means installer accepts existing conditions.

3.2 PREPARATION

A. Disconnect electrical systems in walls, floors, and ceilings to be removed.

B. Coordinate utility service outages with utility company.

C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

D. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.

1. Obtain permission from Owner at least 72 hours before partially or completely disabling system.
2. Make temporary connections to maintain service in areas adjacent to work area.

3.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Perform work for removal and disposal of equipment and materials containing toxic substances regulated under the Federal Toxic Substances Control Act (TSCA) in accordance with applicable federal, and state 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.

3.4 CLEANING AND REPAIR

A. Clean and repair existing materials and equipment that remain or that are to be reused.

B. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

END OF SECTION

SECTION 26 0519
LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Single conductor building wire.

B. Wiring connectors.

C. Electrical tape.

D. Wire pulling lubricant.

E. Cable ties.

1.2 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping.

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

C. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.3 REFERENCE STANDARDS

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2018).

B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011 (Reapproved 2017).

C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010, with Editorial Revision (2020).

D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2020).

E. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2017.

F. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

G. NECA 120 - Standard for Installing Armored Cable (AC) and Metal-Clad Cable (MC); 2012.

H. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2009.

I. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.

J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.

L. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.

M. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.

N. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.

O. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.

P. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.

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

1.5 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

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

1.6 DELIVERY, STORAGE, AND HANDLING

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

1.7 FIELD CONDITIONS

A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F, 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. 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.
    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. Where exposed to damage.
    b. For damp, wet, or corrosive locations, unless provided with a PVC jacket listed as suitable for those locations.
    c. For isolated ground circuits, unless provided with an additional isolated/insulated grounding conductor.

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.

2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
3. Tinned Copper Conductors: Comply with ASTM B33.

I. Minimum Conductor Size:

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. 480Y/277 V, 3 Phase, 4 Wire System:
      1) Phase A: Brown.
      2) Phase B: Orange.
      3) Phase C: Yellow.
      4) Neutral/Grounded: Gray.
   b. 208Y/120 V, 3 Phase, 4 Wire System:
      1) Phase A: Black.
      2) Phase B: Red.
      3) Phase C: Blue.
      4) Neutral/Grounded: White.
   c. Equipment Ground, All Systems: Green.

2.3 SINGLE CONDUCTOR BUILDING WIRE

A. 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.

g. Or engineer pre-approved equivalent.

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 where indicated or required for environment of installed location.

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 for standard applications and 302 degrees F 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 WIRING ACCESSORIES

A. Electrical Tape:

1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.
2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.

B. Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.

C. Cable Ties: Material and tensile strength rating suitable for application.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that work likely to damage wire and cable has been completed.

C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.

D. Verify that field measurements are as indicated.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

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

3.3 INSTALLATION

A. Circuiting Requirements:

1. Unless dimensioned, circuit routing indicated is diagrammatic.
2. When circuit destination is indicated without specific routing, determine exact routing required.
3. Include circuit lengths required to install connected devices within 10 ft of location indicated.
4. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
5. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
6. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is permitted, under the following conditions:
    a. Provide no more than six current-carrying conductors in a single raceway. Dedicated neutral conductors are considered current-carrying conductors.
    b. Increase size of conductors as required to account for ampacity derating.
    c. Size raceways, boxes, etc. to accommodate conductors.
7. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.

B. Install products in accordance with manufacturer's instructions.

C. Perform work in accordance with NECA 1 (general workmanship).

D. Install metal-clad cable (Type MC) in accordance with NECA 120.

E. Installation in Raceway:

1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
2. Pull all conductors and cables together into raceway at same time.
3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.

F. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

G. 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.

H. 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.

I. Install conductors with a minimum of 12 inches of slack at each outlet.

J. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.

K. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

L. Make wiring connections using specified wiring connectors.

1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.

2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.

3. Do not remove conductor strands to facilitate insertion into connector.

4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.

5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.

6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

M. 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.

N. Insulate ends of spare conductors using vinyl insulating electrical tape.

O. 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.

P. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

Q. 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 Division 01 for additional quality 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

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SECTION 26 0526
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Grounding and bonding requirements.

B. Conductors for grounding and bonding.

C. Connectors for grounding and bonding.

D. Ground bars.

1.2 RELATED REQUIREMENTS

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

B. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.3 REFERENCE STANDARDS

A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System; 2012.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Verify exact locations of underground metal water service pipe entrances to building.

2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.

3. Notify Architect/Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install ground rod electrodes until final backfill and compaction is complete.

1.5 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

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

1.6 DELIVERY, STORAGE, AND HANDLING

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

PART 2 PRODUCTS

2.1 GROUNDING AND BONDING REQUIREMENTS

A. Do not use products for applications other than as permitted by NFPA 70 and product listing.

B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

D. 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.

5. Where the source and first disconnecting means are in separate enclosures, provide supply-side bonding jumper between source and first disconnecting means.

E. 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.
8. Provide bonding for interior metal air ducts.
9. Provide bonding for metal building frame.

F. Communications Systems Grounding and Bonding:
1. Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for any additional buildings or structures in accordance with NFPA 70.
2. Provide bonding jumper in raceway from intersystem bonding termination to each communications room or backboard and provide ground bar for termination.
    a. Bonding Jumper Size: 6 AWG, unless otherwise indicated or required.
    b. Raceway Size: 3/4 inch trade size unless otherwise indicated or required.
    c. Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.
    d. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.

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 Bars:
1. Description: Copper rectangular ground bars with mounting brackets and insulators.
2. Size: 12X4 unless otherwise indicated or required.
3. Holes for Connections: As indicated or as required for connections to be made.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that work likely to damage grounding and bonding system components has been completed.
B. Verify that field measurements are as indicated.
C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.
B. Perform work in accordance with NECA 1 (general workmanship).
C. Make grounding and bonding connections using specified connectors.
1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

D. Identify grounding and bonding system components in accordance with Section 26 0553.

3.3 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS except Section 4.

B. Perform inspections and tests listed in NETA ATS, Section 7.13.

C. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.

D. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

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

END OF SECTION

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SECTION 26 0529
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

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

1.2 RELATED REQUIREMENTS

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

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

C. 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; 2016a.

C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2019.

D. MFMA-4 - Metal Framing Standards Publication; 2004.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

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

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

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

1.5 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Comply with applicable building code.

C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

D. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of four times the applied force.

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

F. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.6 DELIVERY, STORAGE, AND HANDLING

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

PART 2 PRODUCTS

2.1 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:

1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported with a minimum safety factor of 2.5. Include consideration for vibration, equipment operation, and shock loads where applicable.
4. Do not use products for applications other than as permitted by NFPA 70 and product listing.
5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
    a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
    b. 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, clamps, etc. suitable for the conduit or cable to be supported.
   1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
   2. Conduit Clamps: Bolted type unless otherwise indicated.

C. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

D. Outlet Box Supports: Hangers, brackets, etc. suitable for the boxes to be supported.

E. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
   1. Comply with MFMA-4.
   2. Channel (Strut) Used as Raceway (only where specifically indicated): Listed and labeled as complying with UL 5B.
   3. Minimum Channel Thickness: Steel sheet, 12 gage, 0.1046 inch.
   4. Minimum Channel Dimensions: 1-5/8 inch width by 13/16 inch height.

F. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
   1. Minimum Size, Unless Otherwise Indicated or Required:
      a. Equipment Supports: 1/2 inch diameter.
      b. Busway Supports: 1/2 inch diameter.
      c. Single Conduit up to 1 inch (27 mm) trade size: 1/4 inch diameter.
      d. Single Conduit larger than 1 inch (27 mm) trade size: 3/8 inch diameter.
      e. Trapeze Support for Multiple Conduits: 3/8 inch diameter.
      f. Outlet Boxes: 1/4 inch diameter.
      g. Luminaires: 1/4 inch diameter.

G. Non-Penetrating Rooftop Supports for Low-Slope Roofs: Steel pedestals with thermoplastic or rubber bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified.
   1. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
   2. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.
   3. Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.

H. Anchors and Fasteners:
   1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
   2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
   3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
   4. Hollow Masonry: Use toggle bolts.

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

PART 3 EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.
B. Perform work in accordance with NECA 1 (general workmanship).
C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
D. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
E. Install support and attachment components for steel conduits in accordance with NECA 101
F. Unless specifically indicated or approved by Architect/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: Also comply with Section 26 0533.13.

K. Box Support and Attachment: Also comply with Section 26 0533.16.

L. Interior Luminaire Support and Attachment: Also comply with Section 26 5100.

M. Preset Concrete Inserts: Use manufacturer provided closure strips to inhibit concrete seepage during concrete pour.

N. Secure fasteners according to manufacturer's recommended torque settings.

O. Remove temporary supports.

P. Identify independent electrical component support wires above accessible ceilings (only where specifically indicated or 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. Inspect support and attachment components for damage and defects.

B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION

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SECTION 26 0533.13
CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).

B. Intermediate metal conduit (IMC).

C. Flexible metal conduit (FMC).

D. Liquidtight flexible metal conduit (LFMC).

E. Electrical metallic tubing (EMT).

F. Rigid polyvinyl chloride (PVC) conduit.

G. Conduit fittings.

H. Accessories.

1.2 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping.

B. Section 26 0526 - Grounding and Bonding for Electrical Systems.

1. Includes additional requirements for fittings for grounding and bonding.

C. Section 26 0529 - Hangers and Supports for Electrical Systems.

D. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

1.3 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2015.

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); 2013.

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. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. UL 1 - Flexible Metal Conduit; Current Edition, Including All Revisions.

L. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.

M. UL 360 - Liquid-Tight Flexible Steel Conduit; Current Edition, Including All Revisions.

N. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.

O. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.

P. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.

Q. UL 1242 - Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.

2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.

3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.

4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.

5. Notify Architect/Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

1.5 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

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

1.6 DELIVERY, STORAGE, AND HANDLING

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

PART 2 PRODUCTS

2.1 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications. Where more than one listed application applies, comply with the most restrictive requirements. Where conduit type for a particular application is not specified, use galvanized steel rigid metal conduit.

C. Underground:

1. Under Slab on Grade: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or rigid PVC conduit.
2. Exterior, Direct-Buried: Use galvanized steel rigid metal conduit, intermediate metallic conduit (IMC), or rigid PVC conduit.
3. Exterior, Embedded Within Concrete: Use galvanized steel rigid metal conduit, intermediate metallic conduit (IMC), or rigid PVC conduit.
4. Where rigid polyvinyl (PVC) conduit is provided, transition to galvanized steel rigid metal conduit where emerging from underground.
5. Where steel conduit is installed in direct contact with earth where soil has a resistivity of less than 2000 ohm-centimeters or is characterized as severely corrosive based on soils report or local experience, use corrosion protection tape to provide supplementary corrosion protection or use PVC-coated galvanized steel rigid metal conduit.
6. Where steel conduit emerges from concrete into soil, use corrosion protection tape to provide supplementary corrosion protection for a minimum of 4 inches on either side of where conduit emerges or use PVC-coated galvanized steel rigid metal conduit.

D. Embedded Within Concrete:

1. Within Slab on Grade: Not permitted.
2. Within Slab Above Ground: Not permitted.

E. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

F. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

G. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

H. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit.

I. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), or electrical metallic tubing (EMT).

J. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).

1. Locations subject to physical damage include, but are not limited to:
    a. Where exposed below 8 feet, except within electrical and communication rooms or closets.

K. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit or intermediate metal conduit (IMC).

L. Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit.

1. Maximum Length: 6 feet.

M. Connections to Vibrating Equipment:

1. Dry Locations: Use flexible metal conduit.
2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
3. Maximum Length: 6 feet unless otherwise indicated.
4. Vibrating equipment includes, but is not limited to:
    a. Transformers.
    b. Motors.

N. Fished in Existing Walls, Where Necessary: Use flexible metal conduit.

2.2 CONDUIT REQUIREMENTS

A. Existing Work: Where existing conduits are indicated to be reused, they may be reused only where they comply with specified requirements, are free from corrosion, and integrity is verified by pulling a mandrel through them.

B. Fittings for Grounding and Bonding: Also comply with Section 26 0526.

C. Provide all conduit, fittings, supports, and accessories required for a complete raceway system.

D. Provide products listed, classified, and labeled as suitable for the purpose intended.

E. Minimum Conduit Size, Unless Otherwise Indicated:
1. Branch Circuits: 3/4 inch (21 mm) trade size.
2. Branch Circuit Homeruns: 3/4 inch (21 mm) trade size.

F. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.3 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

B. Fittings:
1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.
3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

2.4 INTERMEDIATE METAL CONDUIT (IMC)

A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.

B. Fittings:
1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.

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

2.5 FLEXIBLE METAL CONDUIT (FMC)

A. Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.

B. Fittings:

1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

2. Material: Use steel or malleable iron.

2.6 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.

B. Fittings:

1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

2. Material: Use steel or malleable iron.

2.7 ELECTRICAL METALLIC TUBING (EMT)

A. Description: NFPA 70, Type EMT steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

B. Fittings:

1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.

2. Material: Use steel.

3. Connectors and Couplings: Use compression (gland) type.

a. Do not use indenter type connectors and couplings.

b. Do not use set-screw type connectors and couplings.

4. Damp or Wet Locations (where permitted): Use fittings listed for use in wet locations.

5. Embedded Within Concrete (where permitted): Use fittings listed as concrete-tight. Fittings that require taping to be concrete-tight are not acceptable.

2.8 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 ACCESSORIES

A. Conduit Joint Compound: Corrosion-resistant, electrically conductive; suitable for use with the conduit to be installed.

B. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

C. Pull Strings: Use nylon cord with average breaking strength of not less than 200 pound-force.

D. Sealing Compound for Sealing Fittings: Listed for use with the particular fittings to be installed.

E. Modular Seals for Conduit Penetrations: Rated for minimum of 40 psig; Suitable for the conduits to be installed.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive conduits.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

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

B. Perform work in accordance with NECA 1 (general workmanship).

C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.

D. Install intermediate metal conduit (IMC) in accordance with NECA 101.

E. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.

F. Conduit Routing:

1. Unless dimensioned, conduit routing indicated is diagrammatic.
2. When conduit destination is indicated without specific routing, determine exact routing required.
3. Conceal all conduits unless specifically indicated to be exposed.
4. Conduits in the following areas may be exposed, unless otherwise indicated:
    a. Electrical rooms.
    b. Mechanical equipment rooms.
    c. Within joists in areas with no ceiling.
5. Unless otherwise approved, do not route conduits exposed:
    a. Across floors.
    b. Across roofs.
    c. Across top of parapet walls.

d. Across building exterior surfaces.

6. Conduits installed underground or embedded in concrete may be routed in the shortest possible manner unless otherwise indicated. Route all other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
7. Arrange conduit to maintain adequate headroom, clearances, and access.
8. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
9. Arrange conduit to provide no more than 150 feet between pull points.
10. Route conduits above water and drain piping where possible.
11. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
12. Maintain minimum clearance of 6 inches between conduits and piping for other systems.
13. Maintain minimum clearance of 12 inches between conduits and hot surfaces. This includes, but is not limited to:
    a. Heaters.
    b. Hot water piping.
    c. Flues.
14. Group parallel conduits in the same area together on a common rack.

G. Conduit Support:

1. Secure and support conduits in accordance with NFPA 70 and Section 26 0529 using suitable supports and methods approved by the authority having jurisdiction.
2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
4. Use metal channel (strut) with accessory conduit clamps to support multiple parallel surface-mounted conduits.
5. Use conduit clamp to support single conduit from beam clamp or threaded rod.
6. Use trapeze hangers assembled from threaded rods and metal channel (strut) with accessory conduit clamps to support multiple parallel suspended conduits.
7. Use of wire for support of conduits is not permitted.
8. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with the most stringent requirements.

H. Connections and Terminations:

1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
3. Use suitable adapters where required to transition from one type of conduit to another.

4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
6. Where spare conduits stub up through concrete floors and are not terminated in a box or enclosure, provide threaded couplings equipped with threaded plugs set flush with finished floor.
7. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
8. Secure joints and connections to provide maximum mechanical strength and electrical continuity.

I. Penetrations:

1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
2. Make penetrations perpendicular to surfaces unless otherwise indicated.
3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
4. Conceal bends for conduit risers emerging above ground.
5. Seal interior of conduits entering the building from underground at first accessible point to prevent entry of moisture and gases.
6. Provide suitable modular seal where conduits penetrate exterior wall below grade.
7. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
8. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty. Include proposed locations of penetrations and methods for sealing with submittals.
9. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 8400.

J. Underground Installation:

1. Minimum Cover, Unless Otherwise Indicated or Required:
   a. Underground, Exterior: 24 inches.
   b. Under Slab on Grade: 12 inches to bottom of slab.
2. Provide underground warning tape in accordance with Section 26 0553 along entire conduit length for service entrance where not concrete-encased.

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 conduits are subject to earth movement by settlement or frost.

L. Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:

1. Where conduits pass from outdoors into conditioned interior spaces.
2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

M. Provide pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.

N. Provide grounding and bonding in accordance with Section 26 0526.

O. Identify conduits in accordance with Section 26 0553.

3.3 FIELD QUALITY CONTROL

A. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

B. 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

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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, including those used as junction and pull boxes.

B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.

1.2 RELATED REQUIREMENTS

A. Section 26 0529 - Hangers and Supports for Electrical Systems.

B. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

C. Section 26 2726 - Wiring Devices:

1. Wall plates.

2. Additional requirements for locating boxes for wiring devices.

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; 2010.

C. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

D. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013 (Reaffirmed 2020).

E. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. 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 - UL Standard for Safety Industrial Control Panels; 2018.

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 the contract documents. Obtain direction before proceeding with work.

1.5 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

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

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, Including Those Used as Junction and Pull Boxes:

1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.

2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
3. Use suitable concrete type boxes where flush-mounted in concrete.
4. Use suitable masonry type boxes where flush-mounted in masonry walls.
5. Use raised covers suitable for the type of wall construction and device configuration where required.
6. Use shallow boxes where required by the type of wall construction.
7. Do not use "through-wall" boxes designed for access from both sides of wall.
8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
12. Wall Plates: Comply with Section 26 2726.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:

1. Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
2. NEMA EN 10250 Environment Type, Unless Otherwise Indicated:
    a. Indoor Clean, Dry Locations: Type 1, galvanized steel.
3. Junction and Pull Boxes Larger Than 100 cubic inches:
    a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that mounting surfaces are ready to receive boxes.

B. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

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

B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.

E. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.

F. Unless otherwise indicated, boxes may be surface-mounted where exposed conduits are indicated or permitted.

G. Box Locations:

1. Unless dimensioned, box locations indicated are approximate.
2. Locate boxes as required for devices installed under other sections or by others.
    a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 26 2726.
3. Locate boxes so that wall plates do not span different building finishes.
4. Locate boxes so that wall plates do not cross masonry joints.
5. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
6. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches horizontal separation unless otherwise indicated.
7. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches horizontal separation.
8. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
    a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches 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 or such that the total aggregate area of openings exceeds 100 square inches for any 100 square feet of wall area.
9. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:
    a. Concealed above accessible suspended ceilings.
    b. Within joists in areas with no ceiling.
    c. Electrical rooms.
    d. Mechanical equipment rooms.

H. Box Supports:

1. Secure and support boxes in accordance with NFPA 70 and Section 26 0529 using suitable supports and methods approved by the authority having jurisdiction.
2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.

I. Install boxes plumb and level.

J. Flush-Mounted Boxes:

1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch 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 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, using materials and methods specified in Section 07 8400.

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

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

1.3 REFERENCE STANDARDS

A. ANSI Z535.2 - American National Standard for Environmental and Facility Safety Signs; 2011.

B. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2011.

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; 2018.

E. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.

B. Sequencing:

1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.

2. Do not install identification products until final surface finishes and painting are complete.

1.5 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

1.6 FIELD CONDITIONS

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

PART 2 PRODUCTS

2.1 IDENTIFICATION REQUIREMENTS

A. 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.
2. Use identification nameplate to identify equipment utilizing series ratings, where permitted, in accordance with NFPA 70.
3. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.
4. Use identification label on inside of door at each fused switch to identify required NEMA fuse class and size.
5. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.
    a. Service equipment.
    b. Industrial control panels.
    c. Motor control centers.
    d. Elevator control panels.
    e. Industrial machinery.
6. 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.
7. 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.
8. 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".

9. 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 or color-coded bands to identify systems other than normal power system for accessible conduits at maximum intervals of 20 feet.
   a. Color-Coded Bands: Use field-painting or vinyl color coding electrical tape to mark bands 3 inches wide.
      1) Color Code:
         (a) Fire Alarm System: Red.
      2) Vinyl Color Coding Electrical Tape: Comply with Section 26 0519.
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 terminationswhen 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.

D. Identification for Boxes:

1. Use voltage markers to identify highest voltage present.
2. Use identification labels to identify circuits enclosed.
3. 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. Wiring Device and Wallplate Finishes: Comply with Section 26 2726.
2. Use identification label to identify fire alarm system devices.
    a. For devices concealed above suspended ceilings, provide additional identification on ceiling tile below device location.
3. 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.
4. 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.
5. Use identification label to identify receptacles protected by upstream GFI protection, where permitted.

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; engraved text.
    a. Exception: Provide minimum thickness of 1/8 inch when any dimension is greater than 4 inches.
3. Stainless Steel Nameplates: Minimum thickness of 1/32 inch; engraved or laser-etched text.
4. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch; engraved or laser-etched text.
5. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch 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 by 2.5 inches.
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.
5. Color:
   a. Normal Power System: White text on black background.

D. Format for General Information and Operating Instructions:
1. Minimum Size: 1 inch by 2.5 inches.
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.
5. Color: Black text on white background unless otherwise indicated.

E. Format for Receptacle Identification:
1. Minimum Size: 3/8 inch by 1.5 inches.
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. Color: Black text on clear background.

F. Format for Fire Alarm Device Identification:
1. Minimum Size: 3/8 inch by 1.5 inches.
2. Legend: Designation indicated and device zone or address.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch.
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.

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.
3. Markers for Junction Boxes: 1/2 by 2 1/4 inches.

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 wide, with minimum thickness of 5 mil, 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 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 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. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.

4. Elevated Equipment: Legible from the floor or working platform.

5. Branch Devices: Adjacent to device.

6. Interior Components: Legible from the point of access.

7. Conduits: Legible from the floor.

8. Boxes: Outside face of cover.

9. Conductors and Cables: Legible from the point of access.

10. Devices: Outside face of cover.

C. Install identification products centered, level, and parallel with lines of item being identified.

D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.

E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.

F. Install underground warning tape above buried lines with one tape per trench at 3 inches 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. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

END OF SECTION

SECTION 26 0923
LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Occupancy sensors.

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 0553 - Identification for Electrical Systems: Identification products and requirements.

E. Section 26 2726 - Wiring Devices: Devices for manual control of lighting, including wall switches, wall dimmers, and fan speed controllers.

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; 2010.

C. NEMA 410 - Performance Testing for Lighting Controls and Switching Devices with Electronic Drivers and Discharge Ballasts; 2016.

D. 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. 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. Notify Architect/Engineer of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

B. Sequencing:

1. Do not install lighting control devices until final surface finishes and painting are complete.

1.5 SUBMITTALS

A. 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.

B. 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.

C. Field Quality Control Reports.

D. 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.

E. Operation and Maintenance Data: Include detailed information on device programming and setup.

F. Project Record Documents: Record actual installed locations and settings for lighting control devices.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

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

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

1.7 DELIVERY, STORAGE, AND PROTECTION

A. 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. 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. Power Packs for Low Voltage Occupancy Sensors:

1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage occupancy sensors for switching of line voltage loads.
2. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on drawings.
3. Input Supply Voltage: Dual rated for 120/277 V ac.
4. Load Rating: 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. Inspect each lighting control device for damage and defects.

B. 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.

C. 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.

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. Demonstration: Demonstrate proper operation of lighting control devices to Architect/Engineer, and correct deficiencies or make adjustments as directed.

END OF SECTION

SECTION 26 2416
PANELBOARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Power distribution panelboards.

B. Lighting and appliance panelboards.

C. 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 EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

E. NEMA PB 1 - Panelboards; 2011.

F. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 1000V or Less; 2023.

G. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

J. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

K. UL 67 - Panelboards; Current Edition, Including All Revisions.

L. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
5. Notify Architect/Engineer of any conflicts with or deviations from the contract documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.

B. 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.

C. Source Quality Control Test Reports: Include reports for tests designated in NEMA PB 1 as routine tests.

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, and installation of product.

F. Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.

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. Panelboard Keys: Two of each different key.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.

B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

1.8 FIELD CONDITIONS

A. Maintain ambient temperature within the following limits during and after installation of panelboards:

1. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Eaton Corporation: www.eaton.com/#sle.

B. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.

C. Siemens Industry, Inc: www.usa.siemens.com/#sle.

D. Or engineer pre-approved equivalent.

E. Source Limitations: Furnish panelboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.2 PANELBOARDS - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:

1. Altitude: Less than 6,600 feet.

2. Ambient Temperature:

a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

C. Short Circuit Current Rating:

1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

D. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

E. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

F. Bussing: Sized in accordance with UL 67 temperature rise requirements.

1. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

G. Conductor Terminations: Suitable for use with the conductors to be installed.

H. Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.

1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:

a. 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.

L. Provide the following features and accessories where indicated or where required to complete installation:

1. Feed-through lugs.

2. Sub-feed lugs.

2.3 LIGHTING AND APPLIANCE PANELBOARDS

A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated.

B. Conductor Terminations:

1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.

2. Main and Neutral Lug Type: Mechanical.

C. Bussing:

1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.

2. Phase and Neutral Bus Material: Aluminum.
3. Ground Bus Material: Aluminum.

D. Circuit Breakers: Thermal magnetic bolt-on type.

E. Enclosures:

1. Provide surface-mounted enclosures.
2. Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
3. Provide clear plastic circuit directory holder mounted on inside of door.

2.4 OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers:

1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
2. Interrupting Capacity:
   a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
      1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
      2) 14,000 rms symmetrical amperes at 480 VAC.
   b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
3. Conductor Terminations:
   a. Provide mechanical lugs unless otherwise indicated.
   b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
5. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
6. Provide listed switching duty rated circuit breakers with SWD marking for all lighting circuits.
7. Do not use tandem circuit breakers.
8. Do not use handle ties in lieu of multi-pole circuit breakers.

2.5 SOURCE QUALITY CONTROL

A. Factory test panelboards according to NEMA PB 1.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.

B. Verify that mounting surfaces are ready to receive panelboards.

C. Coordinate the panelboard and the surface to be mounted on or in.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.

D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

E. Provide required supports in accordance with Section 26 0529.

F. Install panelboards plumb.

G. 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 above the floor or working platform.

I. Provide minimum of six spare 1 inch 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. Provide filler plates to cover unused spaces in panelboards.

N. Identify panelboards in accordance with Section 26 0553.

3.3 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. 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.

C. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.4 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

B. Adjust alignment of panelboard fronts.

C. Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

3.5 CLEANING

A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.

B. Repair scratched or marred exterior surfaces to match original factory finish.

END OF SECTION

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SECTION 26 2726
WIRING DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wall switches.

B. Receptacles.

C. Wall plates.

1.2 RELATED REQUIREMENTS

A. Section 26 0533.16 - Boxes for Electrical Systems.

B. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

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; 2010.

E. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2015).

F. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2016.

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. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

B. Field Quality Control Test Reports.

C. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

D. Operation and Maintenance Data:

1. GFCI Receptacles: Include information on status indicators.

E. Project Record Documents: Record actual installed locations of wiring 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. Products: Listed, classified, and labeled as suitable for the purpose intended.

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

1.7 DELIVERY, STORAGE, AND PROTECTION

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

PART 2 PRODUCTS

2.1 WIRING DEVICE APPLICATIONS

A. Provide wiring devices suitable for intended use and with ratings adequate for load served.

B. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.

C. Provide GFCI protection for receptacles installed within 6 feet of sinks.

D. Provide GFCI protection for receptacles installed in kitchens.

E. Provide GFCI protection for receptacles serving electric drinking fountains.

2.2 WIRING DEVICE FINISHES

A. Provide wiring device finishes as described below unless otherwise indicated.

B. Wiring Devices, Unless Otherwise Indicated: Gray with stainless steel wall plate.

2.3 WALL SWITCHES

A. Manufacturers:

1. Hubbell Incorporated: www.hubbell.com/#sle.
2. Cooper Wiring Devices
3. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.
4. Lutron
5. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.
6. Or engineer pre-approved equivalent.

B. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20and where applicable FS W-S-896; types as indicated on the drawings.

1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

C. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

2.4 RECEPTACLES

A. Manufacturers:

1. Hubbell Incorporated: www.hubbell.com/#sle.
2. Cooper Wiring Devices.
3. 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.
6. Or engineer pre-approved equivalent.

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 SE suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.

D. GFCI Receptacles:

1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.

a. Provide test and reset buttons of same color as device.

2. 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 SE suitable for installation in damp or wet locations.

2.5 WALL PLATES

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. Or engineer pre-approved equivalent.
6. 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. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.

D. Weatherproof Covers for Wetor 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 above finished floor.

b. Wall Dimmers: 48 inches above finished floor.

c. Receptacles: 18 inches above finished floor or 6 inches above counter.

2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.

3. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.

4. Locate wall switches on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify Architect/Engineer to obtain direction prior to proceeding with work.

C. Install wiring devices in accordance with manufacturer's instructions.

D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

E. Where required, connect wiring devices using pigtails not less than 6 inches 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 the contract documents. Obtain direction before proceeding with work.

1.5 QUALITY ASSURANCE

A. Conform to 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.

D. Or engineer pre-approved equivalent.

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.

H. Class CC Fuses: Comply with UL 248-4.

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 EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

C. NEMA BS 31047 - Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013 (Reaffirmed 2023).

D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.

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 the contract documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.

B. 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.

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, installation, and starting of product.

E. Project Record Documents: Record actual locations of enclosed switches.

F. Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

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

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

1.7 DELIVERY, STORAGE, AND 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 and 104 degrees F 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. Or engineer pre-approved equivalent.

E. Source Limitations: Furnish enclosed switches and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.2 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. Ambient Temperature: Between -22 degrees F and 104 degrees F.

D. Horsepower Rating: Suitable for connected load.

E. Voltage Rating: Suitable for circuit voltage.

F. Short Circuit Current Rating:

1. Minimum Ratings:

a. Switches Protected by Class H Fuses: 10,000 rms symmetrical amperes.

b. Heavy Duty Single Throw Switches Protected by Class R, Class J, Class L, or Class T Fuses: 200,000 rms symmetrical amperes.

c. Double Throw Switches Protected by Class R, Class J, or Class T Fuses: 100,000 rms symmetrical amperes.

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 EN 10250, and list and label as complying with UL 50 and UL 50E.

1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:

a. Indoor Clean, Dry Locations: Type 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 BS 31047.
   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 supports 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 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. Inspect and test in accordance with NETA ATS, except Section 4.

B. Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.

C. 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

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SECTION 26 2923
VARIABLE-FREQUENCY MOTOR CONTROLLERS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Variable frequency controllers.

1.2 RELATED REQUIREMENTS

A. Section 26 0529 - Hangers and Supports for Electrical Systems.

B. Section 26 0553 - Identification for Electrical Systems: Identification products and requirements.

C. Section 26 2813 - Fuses.

1.3 REFERENCE STANDARDS

A. NEMA IS 10034 - Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable Speed Drive Systems; 2022 (Reapproved 2025).

B. NEMA IS 10033 - Adjustable Speed Drives; 2020 (Reapproved 2025).

C. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 SUBMITTALS

A. Product Data: Provide catalog sheets showing voltage, controller size, ratings and size of switching and overcurrent protective devices, short circuit ratings, dimensions, and enclosure details.

B. Shop Drawings: Indicate front and side views of enclosures with overall dimensions and weights shown; conduit entrance locations and requirements; and nameplate legends.

C. Test Reports: Indicate field test and inspection procedures and test results.

D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

E. Manufacturer's Field Reports: Indicate start-up inspection findings.

F. Operation Data: NEMA IS 10034. Include instructions for starting and operating controllers, and describe operating limits that may result in hazardous or unsafe conditions.

G. Maintenance Data: NEMA IS 10034. Include routine preventive maintenance schedule.

1.5 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

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

1.6 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 in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to components, enclosure, and finish.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Variable Frequency Motor Controllers:

1. ABB/GE: www.geindustrial.com/#sle.
2. Danfoss: www.danfoss.com/#sle.
3. Eaton Corporation: www.eaton.com/#sle.
4. Rockwell Automation, Inc.; Allen-Bradley Products: ab.rockwellautomation.com/#sle.
5. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.
6. Siemens Industry, Inc: www.usa.siemens.com/#sle.
7. Toshiba.
8. Yaskanwa America.
9. Or Engineer pre-approved equivalent.

2.2 DESCRIPTION

A. Variable Frequency Controllers: Enclosed controllers suitable for operating the indicated loads, in conformance with requirements of NEMA IS 10033. Select unspecified features and options in accordance with NEMA ICS 3.1.

1. Employ pulse-width-modulated inverter system.
2. Design to attempt five automatic restarts following fault condition before locking out and requiring manual restart.

B. Enclosures: NEMA EN 10250, Type 1, suitable for equipment application in places regularly open to the public.

C. Finish: Manufacturer's standard enamel.

2.3 OPERATING REQUIREMENTS

A. Rated Input Voltage: 208 volts, three phase, 60 Hertz.

B. Motor Nameplate Voltage: 230 volts, three phase, 60 Hertz.

C. Displacement Power Factor: Between 1.0 and 0.95, lagging, over entire range of operating speed and load.

D. Operating Ambient: 0 degrees C to 40 degrees C.

E. Volts Per Hertz Adjustment: Plus or minus 10 percent.

F. Current Limit Adjustment: 60 to 110 percent of rated.

G. Acceleration Rate Adjustment: 0.5 to 30 seconds.

H. Deceleration Rate Adjustment: 1 to 30 seconds.

I. Input Signal: 4 to 20 mA DC.

2.4 COMPONENTS

A. Display: Provide integral digital display to indicate output voltage, output frequency, and output current.

B. Status Indicators: Separate indicators for overcurrent, overvoltage, ground fault, overtemperature, and input power ON.

C. Furnish HAND-OFF-AUTOMATIC selector switch and manual speed control.

D. Include undervoltage release.

E. Control Power Source: Integral control transformer.

F. Safety Interlocks: Furnish terminals for remote contact to inhibit starting under both manual and automatic mode.

G. Control Interlocks: Furnish terminals for remote contact to allow starting in automatic mode.

H. Emergency Stop: Use dynamic brakes for emergency stop function.

I. Disconnecting Means: Include integral circuit breaker on the line side of each controller.

J. Wiring Terminations: Match conductor materials and sizes indicated.

K. Provide line reactors for units serving motor 10HP and greater.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surface is suitable for controller installation.

B. Do not install controller until building environment can be maintained within the service conditions required by the manufacturer.

C. Verify that field measurements are as instructed by manufacturer.

3.2 INSTALLATION

A. Install in accordance with NEMA IS 10034 and manufacturer's instructions.

B. Tighten accessible connections and mechanical fasteners after placing controller.

3.3 FIELD QUALITY CONTROL

A. Inspect and test in accordance with NETA ATS, except Section 4.

B. Perform inspections and tests listed in NETA ATS, Section 7.17. The insulation-resistance test on control wiring listed as optional is not required.

3.4 ADJUSTING

A. Make final adjustments to installed controller to assure proper operation of load system. Obtain performance requirements from installer of driven loads.

3.5 MAINTENANCE

A. Provide warrant of controllers for one year from Date of Substantial Completion.

END OF SECTION

SECTION 26 4300
SURGE PROTECTIVE DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surge protective devices for service entrance locations.

B. Surge protective devices for distribution locations.

1.2 RELATED REQUIREMENTS

A. Section 26 0526 - Grounding and Bonding for Electrical Systems.

B. Section 26 2416 - Panelboards.

1.3 ABBREVIATIONS AND ACRONYMS

A. EMI/RFI: Electromagnetic Interference/Radio Frequency Interference.

B. SPD: Surge Protective Device.

1.4 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

C. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate size and location of overcurrent device compatible with the actual surge protective device and location to be installed. Notify Architect/Engineer of any conflicts or deviations from the contract documents to obtain direction prior to ordering equipment.

1.6 SUBMITTALS

A. Product Data: Include detailed component information, voltage, surge current ratings, repetitive surge current capacity, voltage protection rating (VPR) for all protection modes, maximum continuous operating voltage (MCOV), nominal discharge current (I-n), short circuit current rating (SCCR), connection means including any required external overcurrent protection, enclosure ratings, outline and support point dimensions, weight, service condition requirements, and installed features.

1. SPDs with EMI/RFI filter: Include noise attenuation performance.

B. Shop Drawings: Include wiring diagrams showing all factory and field connections with wire and circuit breaker/fuse sizes.

C. Certificates: Manufacturer's documentation of listing for compliance with the following standards:

1. UL 1449.

D. 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.

E. Operation and Maintenance Data: Include information on status indicators and recommended maintenance procedures and intervals.

1.7 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

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

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

1.8 DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space in accordance with manufacturer's written instructions.

1.9 FIELD CONDITIONS

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

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Field-installed, Externally Mounted Surge Protective Devices:

1. Schneider Electric; Square D Brand Surgelogic Products: www.surgelogic.com.
2. Eaton Electrical Inc.
3. Liebert Corporation.
4. Siemens Energy & Automation, Inc.
5. Or engineer pre-approved equivalent.

B. Source Limitations: Furnish surge protective devices produced by a single manufacturer and obtained from a single supplier.

2.2 SURGE PROTECTIVE DEVICES - GENERAL REQUIREMENTS

A. Description: Factory-assembled surge protective devices (SPDs) for 60 Hz service; listed, classified, and labeled as suitable for the purpose intended; system voltage as indicated on the drawings.

B. Protected Modes:

1. Wye Systems: L-N, L-G, N-G, L-L.

C. UL 1449 Voltage Protection Ratings (VPRs):

1. 480Y/277V System Voltage: Not more than 1,500 V for L-N, L-G, and N-G modes and 2,000 V for L-L mode.

D. UL 1449 Maximum Continuous Operating Voltage (MCOV): Not less than 115% of nominal system voltage.

E. Enclosure Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:

1. Indoor clean, dry locations: Type 12.

2. Outdoor locations: Type 3R.

F. Mounting for Field-installed, Externally Mounted SPDs: Unless otherwise indicated, as specified for the following locations:

1. Provide surface-mounted SPD where mounted in non-public areas or adjacent to surface-mounted equipment.

2.3 SURGE PROTECTIVE DEVICES FOR BRANCH PANELBOARD LOCATIONS

A. Unless otherwise indicated, provide factory-installed, internally mounted SPDs.

B. List and label as complying with UL 1449, Type 1 or Type 2.

C. Provide SPDs utilizing field-replaceable modular or non-modular protection circuits.

D. Surge Current Rating: Not less than 60 kA per mode/120 kA per phase.

E. Repetitive Surge Current Capacity: Not less than 2,000 impulses.

F. UL 1449 Nominal Discharge Current (I-n): 20 kA.

G. UL 1449 Short Circuit Current Rating (SCCR): Not less than the available fault current at the installed location as indicated on the drawings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the service voltage and configuration marked on the SPD are consistent with the service voltage and configuration at the location to be installed.

C. Verify system grounding and bonding is in accordance with Section 26 0526, including bonding of neutral and ground for service entrance and separately derived systems where applicable. Do not energize SPD until deficiencies have been corrected.

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 SPD in accordance with manufacturer's instructions.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Unless indicated otherwise, connect service entrance surge protective device on load side of service disconnect main overcurrent device.

E. Provide conductors with minimum ampacity as required by NFPA 70 and as required by NFPA 70.

F. Install conductors between SPD and equipment terminations as short and straight as possible, not exceeding manufacturer's recommended maximum conductor length. Breaker locations may be reasonably rearranged in order to provide leads as short and straight as possible. Twist conductors together to reduce inductance.

G. Do not energize SPD until bonding of neutral and ground for service entrance and separately derived systems is complete in accordance with Section 26 0526 where applicable. Replace SPDs damaged by improper or missing neutral-ground bond.

3.3 FIELD QUALITY CONTROL

A. Perform inspections and tests listed in NETA ATS Section 7.19.1.

3.4 CLEANING

A. 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.

E. Luminaire accessories.

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 26 0923 - Lighting Control Devices: Automatic controls for lighting including occupancy sensors, outdoor motion sensors, time switches, outdoor photo controls, and daylighting controls.

D. 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 - Supplements; 2017.

C. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Corrigendum 2012).

D. IES LM-79 - Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products; 2008.

E. IES LM-80 - Approved Method: Measuring Luminous Flux and Color Maintenance of LED Packages, Arrays, and Modules; 2015, with Errata (2017).

F. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

G. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; 2025.

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; 2016.

J. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2012.

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 the contract documents to obtain direction prior to proceeding with work.

1.5 SUBMITTALS

A. 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.

B. 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.

C. Certificates for Dimming Ballasts: Manufacturer's documentation of compatibility with dimming controls to be installed.

D. Field quality control reports.

E. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

F. Project Record Documents: Record actual connections and locations of luminaires and any associated remote components.

1.6 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

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

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

1.7 DELIVERY, STORAGE, AND PROTECTION

A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.8 FIELD CONDITIONS

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

1.9 WARRANTY

A. Provide five year manufacturer warranty for all LED luminaires, including drivers.

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: Internally illuminated exit signs with LEDs unless otherwise indicated; complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.

1. Number of Faces: Single or double as indicated or as required for the installed location.
2. Directional Arrows: As indicated or as required for the installed location.

B. Self-Powered Exit Signs:

1. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.
2. Battery: Sealed maintenance-free nickel cadmium unless otherwise indicated.
3. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
4. Provide low-voltage disconnect to prevent battery damage from deep discharge.
5. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101; provide indicator light(s) to report test and diagnostic status.

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.

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. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

E. 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 gage, 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.

F. 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.

G. 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 between supports.
4. Unless otherwise indicated, support pendants from swivel hangers.

H. Install accessories furnished with each luminaire.

I. Bond products and metal accessories to branch circuit equipment grounding conductor.

J. Fluorescent Luminaires Controlled by Dual-Level Switching: Connect such that each switch controls the same corresponding lamps in each luminaire.

K. 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. Inspect each product for damage and defects.

B. Operate each luminaire after installation and connection to verify proper operation.

C. Test fluorescent emergency power supply units to verify proper operation upon loss of normal power supply.

D. 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. 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 1300
COMMUNICATIONS BACKBONE CABLING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. 62.5/125-micrometer, optical fiber cabling.

1.3 DEFINITIONS

A. BICSI: Building Industry Consulting Service International.

B. EMI: Electromagnetic interference.

C. IDC: Insulation displacement connector.

D. LAN: Local area network.

E. RCDD: Registered Communications Distribution Designer.

1.4 PERFORMANCE REQUIREMENTS

A. General Performance: Backbone cabling system shall comply with transmission standards in TIA/EIA-568-B.1, when tested according to test procedures of this standard.

1.5 ACTION SUBMITTALS

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

1. For fiber optic cable, include the following installation data for each type used:

a. Nominal OD.

b. Minimum bending radius.

c. Maximum pulling tension.

1.6 CLOSEOUT SUBMITTALS

A. 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.
4. Printout of software application and graphic screens.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1. Test optical fiber cable to determine the continuity of the strand end to end. Use optical fiber flashlight.

PART 2 PRODUCTS

2.1 PATHWAYS

A. General Requirements: Comply with TIA/EIA-569-A.

B. Cable Support: NRTL labeled for support of Category 6 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.

1. Support brackets with cable tie slots for fastening cable ties to brackets.
2. Lacing bars, spools, J-hooks, and D-rings.
3. Straps and other devices.

2.2 OPTICAL FIBER CABLE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Belden Inc.
2. Berk-Tek; a Nexans company.
3. CommScope, Inc.
4. Corning Cable Systems.
5. General Cable Technologies Corporation.
6. Hubbell Premise Wiring
7. Hitachi Cable America, Inc.
8. Mohawk; a division of Belden CDT.
9. Optical Connectivity Solutions Division; Emerson Network Power.
10. Optical Cable Corporation.
11. Or Engineer pre-approved equivalent.

B. Description: Multimode, 62.5/125-micrometer, 48-fiber, tight buffer, optical fiber cable.

1. Comply with ICEA S-83-596 for mechanical properties.
2. Comply with TIA/EIA-568-B.3 for performance specifications. Provide OM4.
3. Comply with TIA/EIA-492AAAA-B for detailed specifications.
4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:

a. Plenum Rated, Nonconductive: Type OFNP, complying with NFPA 262.

5. Maximum Attenuation: 3.50 dB/km at 850 nm; 1.5 dB/km at 1300 nm.
6. Minimum Modal Bandwidth: 160 MHz-km at 850 nm; 500 MHz-km at 1300 nm.

C. Jacket:

1. Jacket Color: Aqua for 50/125-micrometer cable.
2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA/EIA-598-B.
3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches (1000 mm).

2.3 OPTICAL FIBER CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Belden CDT Inc.; Electronics Division.
2. Comscope Inc
3. Ortronics; a subsidiary of Legrand.
4. Optical Cable Corporation.
5. Panduit Corp.
6. Siemon Co. (The).
7. Signamax.
8. Or Engineer pre-approved equivalent.

B. Cross-Connects and Patch Panels: Modular panels housing multiple-numbered, duplex cable connectors.

1. Number of Connectors per Field: One for each fiber of cable or cables assigned to field, plus spares and blank positions adequate to suit specified expansion criteria.

C. Patch Cords: Factory-made, dual-fiber cables in 36-inch (900-mm) lengths.

D. Cable Connecting Hardware:

1. Comply with Optical Fiber Connector Intermateability Standards (FOCIS) specifications of TIA/EIA-604-2, TIA/EIA-604-3-A, and TIA/EIA-604-12. Comply with TIA/EIA-568-B.3.
2. Quick-connect, simplex and duplex, Type SC connectors. Insertion loss not more than 0.75 dB.
3. Type SFF connectors may be used in termination racks, panels, and equipment packages.

2.4 IDENTIFICATION PRODUCTS

A. Comply with TIA/EIA-606-B and UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.5 SOURCE QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate cables.

B. Factory test cables on reels according to TIA/EIA-568-B.1.

C. Factory test multimode optical fiber cables according to TIA/EIA-526-14-A and TIA/EIA-568-B.3.

D. Cable will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

PART 3 EXECUTION

3.1 INSTALLATION OF CABLES

A. Comply with NECA 1.

B. Optical Fiber Cable Installation:

1. Comply with TIA/EIA-568-B.3.
2. Cable may be terminated on connecting hardware that is rack or cabinet mounted.

C. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend UTP cable not in a wireway or pathway, a minimum of 8 inches (200 mm) above ceilings by cable supports not more than 60 inches (1524 mm) apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

3.2 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Visually inspect UTP and optical fiber jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-B.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Optical Fiber Cable Tests:

a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

b. Link End-to-End Attenuation Tests:

1) Horizontal and multimode backbone link measurements: Test at 850 or 1300 nm in 1 direction according to TIA/EIA-526-14-A, Method B, One Reference Jumper.
2) Attenuation test results for backbone links shall be less than 2.0 dB. Attenuation test results shall be less than that calculated according to equation in TIA/EIA-568-B.1.

C. Data for each measurement shall be documented. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.

D. Remove and replace cabling where test results indicate that they do not comply with specified requirements.

E. End-to-end cabling will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

END OF SECTION

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SECTION 28 0513
CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY

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. Low-voltage control cabling.
2. Control-circuit conductors.
3. Fire alarm wire and cable.
4. Identification products.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1.4 FIELD CONDITIONS

A. Do not install conductors and cables that are wet, moisture damaged, or mold damaged.

1. Indications that wire and cables are wet or moisture damaged include, but are not limited to, discoloration and sagging of factory packing materials.

B. Environmental Limitations: Do not deliver or install UTP, optical fiber, and coaxial cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

B. 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.

2.2 LOW-VOLTAGE CONTROL CABLE

A. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.

1. One pair, twisted, No. 16 AWG, stranded (19x29) tinned copper conductors.

2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with NFPA 262.

2.3 CONTROL-CIRCUIT CONDUCTORS

A. Class 1 Control Circuits: Stranded copper, Type THHN-THWN, complying with UL 83, in raceway.

B. Class 2 Control Circuits: Stranded copper, Type THHN-THWN, complying with UL 83, in raceway.

C. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type TW or TF, complying with UL 83.

2.4 FIRE ALARM WIRE AND CABLE

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Belden
2. Draka Cableteq USA.
3. General Cable - Carol Brand.
4. Genesis Cable Products; Honeywell International, Inc.
5. Rockbestos-Suprenant Cable Corp.
6. West Penn.
7. Or Engineer pre-approved equal

B. General Wire and Cable Requirements: NRTL listed and labeled as complying with NFPA 70, Article 760.

C. Signaling Line Circuits: Twisted, shielded pair, No. 18 AWG.

D. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation.

1. Line-Voltage Circuits: No. 12 AWG, minimum.
2. Multiconductor Armored Cable: NFPA 70, Type MC, copper conductors, Type TFN/THHN conductor insulation, copper drain wire, copper armor with red identifier stripe, NTRL listed for fire alarm and cable tray installation, plenum rated, and complying with requirements in UL 2196 for a 2-hour rating.

2.5 IDENTIFICATION PRODUCTS

A. Comply with requirements in Section 26 0553 "Identification for Electrical Systems."

2.6 SOURCE QUALITY CONTROL

A. Cable will be considered defective if it does not pass tests and inspections.

B. Prepare test and inspection reports.

PART 3 EXECUTION

3.1 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements in Section 26 0529 "Hangers and Supports for Electrical Systems" for installation of supports for cables.

3.2 WIRING METHOD

A. Install wiring in metal pathways and wireways.

1. Minimum conduit size shall be 3/4 inch (21 mm). Control and data transmission wiring shall not share conduit with other building wiring systems.

B. Install cable, concealed in accessible ceilings, walls, and floors when possible.

C. Wiring within Enclosures:

1. Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.
2. Install lacing bars and distribution spools.
3. Separate power-limited and non-power-limited conductors as recommended in writing by manufacturer.
4. Install conductors parallel with or at right angles to sides and back of enclosure.
5. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with intrusion system to terminal blocks.
6. Mark each terminal according to system's wiring diagrams.
7. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Comply with NECA 1.

B. Conductors: Size according to system manufacturer's written instructions unless otherwise indicated.

C. General Requirements for Cabling:

1. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
2. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
3. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
4. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
5. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.

3.4 FIRE ALARM WIRING INSTALLATION

A. Comply with NECA 1 and NFPA 72.

B. Wiring Method: Install wiring in metal raceway according to Section 28 0528 "Pathways for Electronic Safety and Security."

1. Install plenum cable in environmental air spaces, including plenum ceilings.

C. Wiring Method:

1. Cables and raceways used for fire alarm circuits, and equipment control wiring associated with the fire alarm system, may not contain any other wire or cable.

2. Signaling Line Circuits: Power-limited fire alarm cables shall not be installed in the same cable or raceway as signaling line circuits.

D. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

E. Color-Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and another for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.

F. Wiring to Remote Alarm Transmitting Device: 1-inch (25-mm) conduit between the fire alarm control panel and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.

3.5 POWER AND CONTROL-CIRCUIT CONDUCTORS

A. 120-V Power Wiring: Install according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables" unless otherwise indicated.

3.6 CONNECTIONS

A. Comply with requirements in Section 283111 "Digital, Addressable Fire-Alarm System for connecting, terminating, and identifying wires and cables.

3.7 FIRESTOPPING

A. Comply with requirements in Section 078400 "Penetration Firestopping."

3.8 GROUNDING

A. For low-voltage wiring and cabling, comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

3.9 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.10 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.

B. Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide, or transfer the data from the instrument to the computer, save as text files, print, and submit.

C. End-to-end cabling will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION

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SECTION 28 0528
PATHWAYS FOR ELECTRONIC SAFETY AND SECURITY

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. Metal conduits, tubing, and fittings.
2. Boxes, enclosures, and cabinets.

PART 2 PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

A. General Requirements for Metal Conduits and Fittings:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. GRC: Comply with ANSI C80.1 and UL 6.

C. IMC: Comply with ANSI C80.6 and UL 1242.

D. EMT: Comply with ANSI C80.3 and UL 797.

E. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

F. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Fittings for EMT:

a. Material: Steel or die cast.

b. Type: Setscrew or compression.

2. Expansion Fittings: PVC or steel to match conduit type, complying with UL 467, rated for environmental conditions where installed, and including flexible external bonding jumper.

G. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Cooper Technologies Company; Cooper Crouse-Hinds.
2. Erickson Electrical Equipment Company.
3. Hubbell Incorporated; Killark Division.

4. Milbank Manufacturing Co.
5. O-Z/Gedney; a brand of EGS Electrical Group.
6. Thomas & Betts Corporation.
7. Wiremold / Legrand.
8. Engineer Pre-Approved Equivalent.

B. General Requirements for Boxes, Enclosures, and Cabinets:

1. Boxes, enclosures and cabinets installed in wet locations shall be listed for use in wet locations.

C. Sheet-Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

E. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

F. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

G. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.

H. Device Box Dimensions: 4-inches square by 2-1/8 inches deep (100 mm square by 60 mm deep).

I. Gangable boxes are prohibited.

J. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise indicated.

1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.

K. Cabinets:

1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.
5. Accessory feet where required for freestanding equipment.

PART 3 EXECUTION

3.1 PATHWAY APPLICATION

A. Outdoors: Apply pathway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC.
2. Concealed Conduit, Aboveground: IMC.
3. Underground Conduit: RNC, Type EPC-80-PVC, direct buried.

4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.

B. Indoors: Apply pathway products as specified below unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Exposed and Subject to Severe Physical Damage: GRC. Pathway locations include the following:
   a. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
   b. Mechanical rooms.
4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric-Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
6. Damp or Wet Locations: GRC.
7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

C. Minimum Pathway Size Indoor: 3/4-inch (21-mm) trade size. Minimum size for optical-fiber cables is 1 inch (27 mm).

D. Minimum Pathway Size Outdoor: 1-inch (27-mm) trade size. Minimum size for optical-fiber cables is 1 inch (27 mm

E. Pathway Fittings: Compatible with pathways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use setscrew or compression, cast-metal fittings. Comply with NEMA FB 2.10.
4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

3.2 INSTALLATION

A. Comply with NECA 1, NECA 101, and TIA-569-B for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum pathways. Comply with NFPA 70 limitations for types of pathways allowed in specific occupancies and number of floors.

B. Keep pathways at least 6 inches (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal pathway runs above water and steam piping.

C. Complete pathway installation before starting conductor installation.

D. Comply with requirements in Section 26 0529 "Hangers and Supports for Electrical Systems" for hangers and supports.

E. Arrange stub-ups so curved portions of bends are not visible above finished slab.

F. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications wiring conduits for which only two 90-degree bends are allowed. Support within 12 inches (300 mm) of changes in direction.

G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

H. Support conduit within 12 inches (300 mm) of enclosures to which attached.

I. Stub-ups to Above Accessible Ceilings:

1. Use EMT, IMC, or RMC for pathways.
2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

J. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of pathway and fittings before making up joints. Follow compound manufacturer's written instructions.

K. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install insulated bushings on conduits terminated with locknuts.

L. Install pathways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.

M. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to conduit assembly to assure a continuous ground path.

N. Cut conduit perpendicular to the length. For conduits of 2-inch (53-mm) trade size and larger, use roll cutter or a guide to ensure cut is straight and perpendicular to the length.

O. Install pull wires in empty pathways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches (300 mm) of slack at each end of pull wire. Cap underground pathways designated as spare above grade alongside pathways in use.

P. Install pathway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed pathways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install pathway sealing fittings according to NFPA 70.

Q. Install devices to seal pathway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all pathways at the following points:

1. Where an underground service pathway enters a building or structure.
2. Where otherwise required by NFPA 70.

R. Flexible Conduit Connections: Comply with NEMA RV 3. Use maximum of 72 inches (1830 mm) of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations subject to severe physical damage.

S. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

T. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surface to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.

U. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

V. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

W. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

3.3 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078400 "Penetration Firestopping."

3.4 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

END OF SECTION

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SECTION 28 3111
DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM

NFPAPART 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. See Divsion 01 for submittal procedures, quality requirments, alterations of work, and closeout requirements.

1.2 SUMMARY

A. Section Includes:

1. Fire-alarm control unit.
2. Manual fire-alarm boxes.
3. System smoke detectors.
4. Heat detectors.
5. Notification appliances.
6. Remote annunciator.
7. Addressable interface device.
8. Digital alarm communicator transmitter.

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.

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. 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. 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 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.

1.9 SOFTWARE SERVICE AGREEMENT

A. Comply with UL 864.

B. Technical Support: Beginning with Substantial Completion, provide software support for two years.

C. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.

1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Siemens Building Technologies, Inc.; Fire Safety Division.
2. Engineer pre-approved equivalent.

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.
6. Heat detectors in elevator shaft and pit.

B. Fire-alarm signal shall initiate the following actions:
   1. Continuously operate alarm notification appliances.
   2. Identify alarm at fire-alarm control unitand remote annunciators.
   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. Elevator shunt-trip supervision.

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.
   9. Fire-pump power failure, including a dead-phase or phase-reversal condition.

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

A. General Requirements for Fire-Alarm Control Unit:
   1. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864 and listed and labeled by an NRTL.
      a. System software and programs shall be held in flash electrically erasable programmable read-only memory (EEPROM), retaining the information through failure of primary and secondary power supplies.
      b. Include a real-time clock for time annotation of events on the event recorder
   2. Addressable initiation devices that communicate device identity and status.

B. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

1. Annunciator and Display: Liquid-crystal type, 3 line(s) of 80 characters, minimum.
2. Keypad: Arranged to permit entry and execution of programming, display, and control commands.

C. Circuits:

1. Initiating Device, Notification Appliance, and Signaling Line Circuits: NFPA 72, Class A.
    a. Initiating Device Circuits: Style D.
    b. Notification Appliance Circuits: Style Z.
    c. Signaling Line Circuits: Style 2.
    d. Install no more than 50 addressable devices on each signaling line circuit.

D. Notification Appliance Circuit: Operation shall sound in a temporal pattern.

E. Elevator Recall:

1. Smoke detectors at the following locations shall initiate automatic elevator recall.
    a. Elevator lobby detectors except the lobby detector on the designated floor.
    b. Smoke detector in elevator machine room.
2. Elevator lobby detectors located on the designated recall floors shall be programmed to move the cars to the alternate recall floor.
3. Water-flow alarm connected to sprinkler in an elevator shaft and elevator machine room shall shut down elevators associated with the location without time delay.

F. Door Controls: Door hold-open devices that are controlled by smoke detectors at doors in smoke barrier walls shall be connected to fire-alarm system.

G. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and change those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory, and print out the final adjusted values on system printer.

H. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.

I. Voice/Alarm Signaling Service: Central emergency communication system with redundant microphones, preamplifiers, amplifiers, and tone generators provided as a special module that is part of fire-alarm control unit.

1. Indicated number of alarm channels for automatic, simultaneous transmission of different announcements to different zones or for manual transmission of announcements by use of the central-control microphone. Amplifiers shall comply with UL 1711 and be listed by an NRTL.
    a. Allow the application of and evacuation signal to indicated number of zones and, at same time, allow voice paging to the other zones selectively or in any combination.
    b. Standard digitally recorded messages for "Evacuation" and "All Clear."

c. Generate tones to be sequenced with audio messages of type recommended by NFPA 72 and that are compatible with tone patterns of notification appliance circuits of fire-alarm control unit.

2. Status Annunciator: Indicate the status of various voice/alarm speaker zones and the status of firefighters' two-way telephone communication zones.

3. Preamplifiers, amplifiers, and tone generators shall automatically transfer to backup units, on primary equipment failure.

J. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory signals shall be powered by 24-V dc source.

K. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.

1. Batteries: Sealed lead calcium.

L. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

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, breaking-glass or plastic-rod 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.

D. Continuous Linear Heat-Detector System:

1. Detector Cable: Rated detection temperature 221 deg F (105 deg C). NRTL listed for "regular" service and a standard environment. Cable includes two steel actuator wires twisted together with spring pressure, wrapped with protective tape, and finished with PVC outer sheath. Each actuator wire is insulated with heat-sensitive material that reacts with heat to allow the cable twist pressure to short- circuit wires at the location of elevated temperature.
2. Control Unit: Two-zone or multizone unit as indicated. Provide same system power supply, supervision, and alarm features as specified for fire-alarm control unit.

3. Signals to Fire-Alarm Control Unit: Any type of local system trouble shall be reported to fire-alarm control unit as a composite "trouble" signal. Alarms on each detection zone shall be individually reported to central fire-alarm control unit as separately identified zones.

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. 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.

C. 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.

D. Voice/Tone Notification Speaker Cluster

1. Comply with UL 1480.
2. Integral matching transformerwith adjustable wattage tap selector
3. Cluster configuration shall include two, three, or four 15 W loudspeakers as indicated on the plans. Speakers shall be swivel mounted for adjustability.
4. High intensity 115/177 cd strobe, selectable in the field.
5. Ceiling mounted.

2.8 REMOTE ANNUNCIATOR

A. Description: Annunciator functions shall match those of fire-alarm control unit for alarm, supervisory, and trouble indications. Manual switching functions shall match those of fire-alarm control unit, including acknowledging, silencing, resetting, and testing.

1. Mounting: Flush cabinet, NEMA 250, Type 1.

B. Display Type and Functional Performance: Alphanumeric display and LED indicating lights shall match those of fire-alarm control unit. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

2.9 ADDRESSABLE INTERFACE DEVICE

A. Description: Microelectronic monitor module, NRTL listed for use in providing a system address for alarm-initiating devices for wired applications with normally open contacts.

2.10 DIGITAL ALARM COMMUNICATOR TRANSMITTER

A. Digital alarm communicator transmitter shall be acceptable to the remote central station and shall comply with UL 632 and be listed and labeled by an NRTL.

B. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit and automatically capture one telephone line(s) and dial a preset number for a remote central station. When contact is made with central station(s), signals shall be transmitted. If service on line is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. Transmitter shall automatically report telephone service restoration to the central station. If service is lost on both telephone lines, transmitter shall initiate the local trouble signal.

C. Local functions and display at the digital alarm communicator transmitter shall include the following:

1. Verification that both telephone lines are available.
2. Programming device.
3. LED display.

D. Digital data transmission shall include the following:

1. Address of the alarm-initiating device.
2. Address of the supervisory signal.
3. Address of the trouble-initiating device.
4. Loss of ac supply or loss of power.
5. Communication bus failure.

E. Secondary Power: Integral rechargeable battery and automatic charger.

F. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

2.11 DEVICE GUARDS

A. Description: Welded wire mesh of size and shape for the manual station, smoke detector, gong, or other device requiring protection.

1. Factory fabricated and furnished by manufacturer of device.
2. Finish: Paint of color to match the protected device.

PART 3 EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Comply with NFPA 72 for installation of fire-alarm equipment.

B. Equipment Mounting: Install fire-alarm control unit on concrete base with tops of cabinets not more than 72 inches (1830 mm) above the finished floor.

1. 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.
2. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
3. Install anchor bolts to elevations required for proper attachment to supported equipment.

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.

J. Annunciator: Install with top of panel 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 GROUNDING

A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

3.5 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.

3.6 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